MARCH 7, 1955

Electrical World

Price 35 Cents

A McGRAW-HILL PUBLICATION

Keep sludge, rust and foam out of YOUR turbines

HERE'S HOW turbine operators all over the country assure clean, efficient performance, greater bearing protection, and maintain instantaneous governor response. They use *Texaco Regal Oil R&O.*

Texaco Regal Oil R&O is premium quality oil. Selected base stocks are carefully refined, then *further improved* by special additives and processing designed to increase oxidation resistance, prevent sludge, rust and foam throughout its extra long service life.

There is a complete line of *Texaco Regal Oils R&O* to meet the stringent requirements of all leading turbine builders for all types and sizes of turbines.

Let a Texaco Lubrication Engineer help you get maximum efficiency from all your power plant equipment. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

TEXACO Regal Oils R&O

FOR ALL TURBINES

TUNE IN: TEXACO STAR THEATER starring DONALD O'CONNOR or JIMMY DURANTE, on TV Sat. nights. METROPOLITAN OPERA radio broadcasts Sat. afternoons.

Electrical World

Vol 143 No 10 March 7, 1955

EDITORIALS—Pertinent comment on the industry's problems and accomplishments 71

THE ELECTRICAL WEEK—Last minute news briefly told 72

NEWS—Complete coverage of activities affecting the industry 74

FEATURES:

MANAGEMENT SHOULD LOOK TO EXPENSE CONTROL FOR A MORE EFFICIENT OPERATION ..... John T. Kimball 80

IEC'S METAL SHEATH HEATER COURSE REWARDS UTILITIES AND CUSTOMERS 82

NEW TEST RATES ENGINEER'S ABILITY ..... Marvin D. Dunnette 86

FLEXIBLE MAPPING SCHEME SAVES ENGINEERS' TIME ..... Ivan C. Eppley 88

BREAK-EVEN LOAD CURVES INDICATE ECONOMICAL TRANSFORMER SIZES Zane Todd 90

TRANSMISSION STRUCTURE DESIGN CONSERVES R-O-W ..... Paul R. Heim 93

COORDINATE SECTIONALIZERS WITH STATION BREAKERS Aubrey A. Mollenhauer, Donald Purdy, and R. J. Lawrence 96

ELECTRONIC FREQUENCY AND LOAD CONTROL 100

HOW TO—Practical ideas for those who design, construct, operate, and maintain 103

INDUSTRIAL APPLICATIONS—Successful applications of electricity in industry 126

SALES AND SERVICE—Commercial, rural, and residential uses of electricity 130

MANUFACTURERS & MARKETS—Information on electrical manufacturers and today's markets 172

NEWS ABOUT PEOPLE—Personnel changes throughout the industry 180

FINANCE & REGULATION—Securities and financing news 202

STATISTICS—The industry's progress in figures 205

Engineering Reference Sheet .. 117
New Equipment 136
Catalogs and Bulletins 170
Books 171
Meetings Calendar 183
Index of Advertisers 191
Public Relations 196
Readers Forum 198
Technical Notes 200
Washington Comment 200

Published for 81 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

FISCHER BLACK, Publisher and Editor
JESSE MOCK ..... Asst to the Editor

DANIEL T BRAYMER ..... Managing Editor
LEONARD M OLMSTED ..... Associate Editor
KENNETH K KOST ..... Associate Editor
HERBERT R FRANKEL ..... Associate Editor
RUE M SHOOP ..... Associate Editor
GEORGE SWIFT ..... Associate Editor
V CRAIG RICHTER ..... Associate Editor
EDWARD ALLEN ..... Midwestern Editor
HOWARD S KNOWLTON ..... New England Editor
JOHN J KEARNEY ..... Middle Eastern Editor
FRANCIS KOVALCIK ..... Western Editor
DAVID REA ..... Northeastern Editor
JEANNE BERNHARDT ..... News-Editor
IRIS ST. CLAIR ..... Departmental Editor
E BRYSON SESSIONS ..... Assistant Editor
ALLEN LONG ..... Assistant Editor
ARTHUR J STEGEMAN ..... Assistant Editor
ARY MOSSIMAN ..... Manager of Market Research
JOAN STEEN ..... Statistician
FRANK C STOCKMAN ..... Art Director
DENISE HENNESSY ..... Production Editor
G B BRYANT, JR ..... Mgr. Washington Bureau
W. GILMOUR ..... Washington Correspondent
DEXTER M KEEZER ..... Dir Economics Dept
RICHARD W EVERETT ..... Economics Dept
A E KNOWLTON ..... Consulting Editor

DOMESTIC NEWS SERVICE: Atlanta, Chicago, Cleveland, Detroit, Houston, San Francisco.

WORLD NEWS BUREAU: John Wilhelm, Editor, Bonn, London, Mexico City, Paris, Sao Paulo, Tokyo.

WARREN W SHEW ..... Sales Manager

DISTRICT MANAGERS: E F Coffey, New York; N V Palmer, Boston; F P Coyle, Philadelphia; M S Kearney, Cleveland; E S Chapin, Detroit; W H Meneilley, Chicago; J T Schaefer, St. Louis; C W Dysinger, Los Angeles; R C Alcorn and T H Carmody, San Francisco; William Lanier, Atlanta; James Cash, Dallas.

OTTO DRECHSEL ..... Business Manager

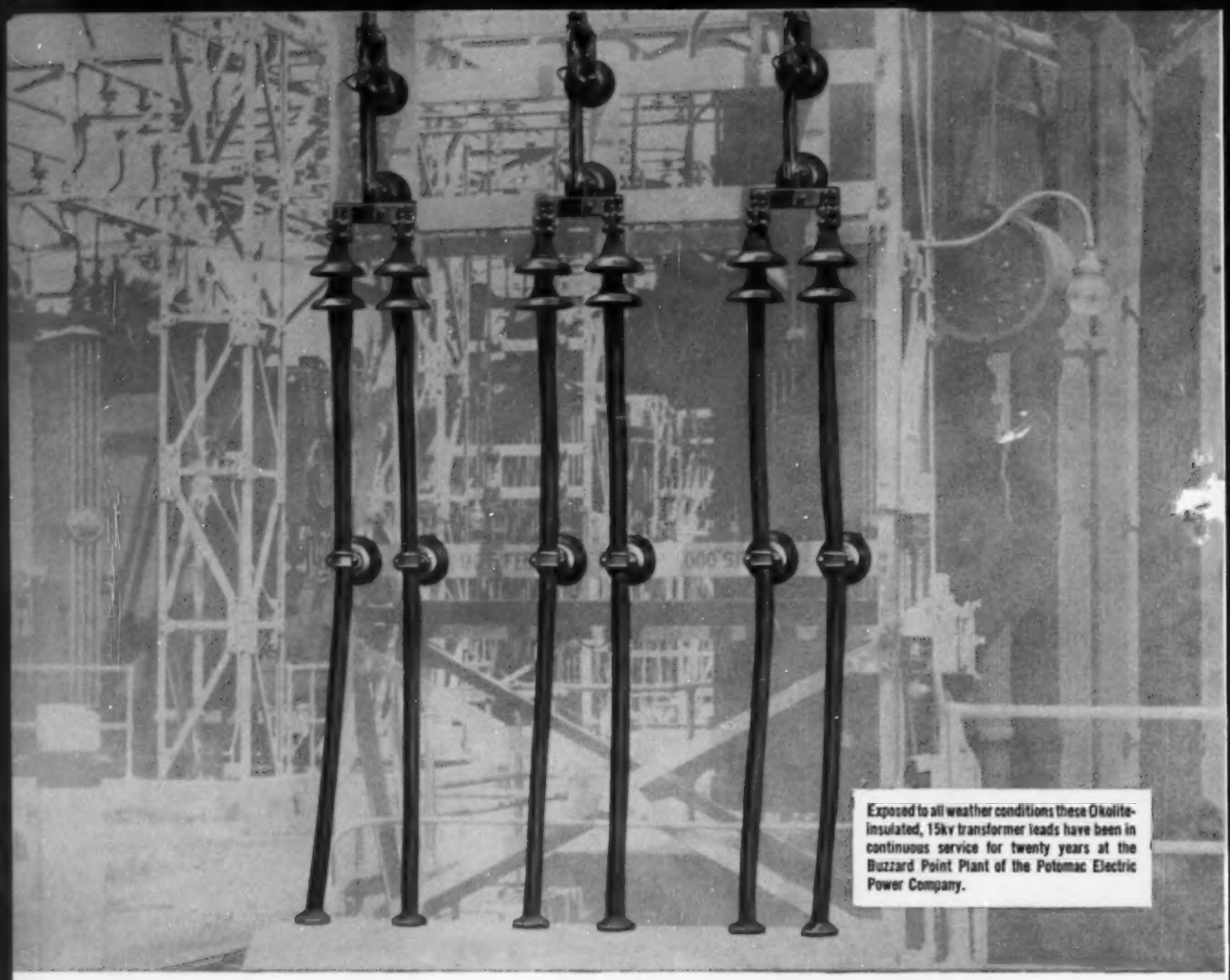
ELECTRICAL WORLD
Published weekly by McGraw-Hill Publishing Co., Inc. Executive, Editorial, and Advertising Offices: McGraw-Hill Building, 330 West 42nd Street, New York 36, N. Y. Publication office, 99-129 North Broadway, Albany 1, N. Y.

Donald C. McGraw, President; Willard Chevalier, Executive Vice President; Joseph A. Gerardi, Vice President and Treasurer; John J. Cooke, Secretary; Paul Montgomery, Executive Vice President, Publications Division; Ralph B. Smith, Vice President and Editorial Director; Nelson Bond, Vice President and Director of Advertising; J. E. Blackburn, Jr., Vice President and Director of Circulation.

Subscriptions: Address correspondence to Electrical World—Subscription Service, 99-129 North Broadway, Albany 1, N. Y. or 330 W. 42nd St., New York 36, N. Y. Allow one month for change of address.

Subscriptions are accepted only from executive, supervisory, and engineering personnel in electric utilities, manufacturing companies, and related fields. Position and company connection must be indicated on subscription orders.

Single copies 35c. For the United States and possessions $6 a year, $9 for two years, $12 for three years. Canada, $7 for one year, $11 for two years, $14 for three years. (Canadian money, at par.) Other Western Hemisphere, and the Philippines, $15 for one year, $25 for two years, $30 for three years. All other countries $25 for one year, $40 for two years, $50 for three years. Entered as second-class matter at the Post Office at Albany, N. Y. Printed in USA. Copyright 1955 by McGraw-Hill Publishing Company, Inc. Permission required to reproduce any of contents.

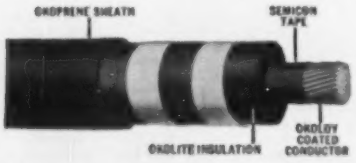


Exposed to all weather conditions these Okolite-insulated, 15kv transformer leads have been in continuous service for twenty years at the Buzzard Point Plant of the Potomac Electric Power Company.

the important cable question: *will it last?*

"Will the cable last?" With installation, maintenance and replacement costs at an all time high, cable users are making this their principal buying guide.

Okonite answers this question with



Okolite-Okoprene—a cable with a thoroughly established service record for long life. Okolite, the only oil-base rubber insulation made with natural wild Up-River Fine Para rubber, is compounded with an exclusive oil-base formula developed by Okonite in 1924. It is recommended for general use up to 35,000 volts.

Okoprene, a neoprene-base compound, is bonded to the Okolite insulation through vulcanization in a metal mold. Introduced to the trade by Okonite in 1935, this non-metallic protective covering provides a tough, service-proved, weather resistant sheath.

Hundreds of case histories provide positive proof of the long life and dependability of Okonite cables. One such installation is pictured above.

Next time you buy a rubber-insulated cable, be *sure* it's going to last.

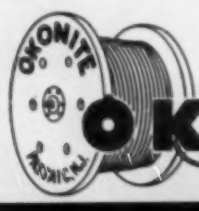
To be sure: specify Okolite for

1. High resistance to corona cutting (ozone), moisture and heat.
2. High current carrying capacity and dielectric strength.
3. Low specific inductive capacity and power factor.

To be sure: specify Okoprene for

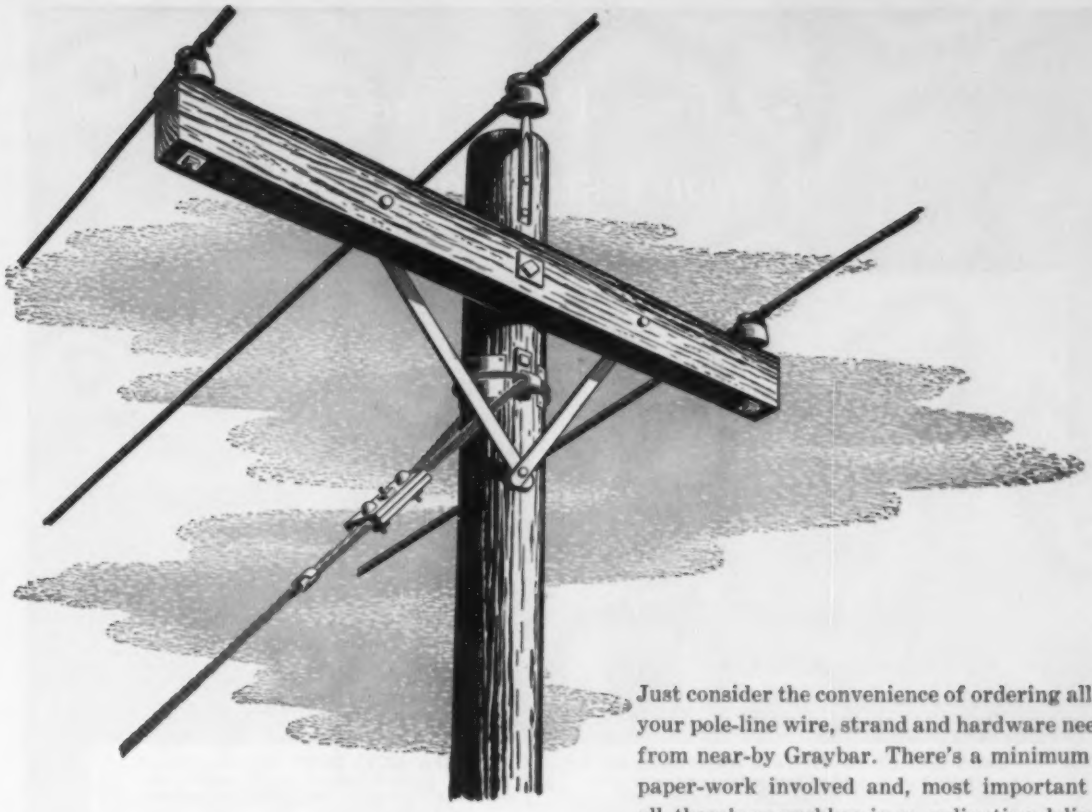
1. Additional insulating strength.
2. High resistance to heat, weather, abrasion, corrosion.
3. High surface resistivity and ozone resistance.

THE OKONITE COMPANY • PASSAIC, N. J.



OKONITE SINCE 1878 ***insulated cables***

2890



Just consider the convenience of ordering all of your pole-line wire, strand and hardware needs from near-by Graybar. There's a minimum of paper-work involved and, most important of all, there's no problem in co-ordinating deliveries from numerous widely-separated suppliers.

LINE WIRE
STRAND
HARDWARE

...all via GraybaR

Graybar thoroughly understands the needs of the nation's power companies . . . can furnish supplies and materials "from the bottom of the hole to the top of the pole." Graybar Outside Construction Specialists are always ready to help you plan or carry out any project.

Taken all together, you can see why it pays to call Graybar first for everything electrical . . . routine or emergency. *Graybar Electric Company, Inc. Executive Offices: Graybar Building, 420 Lexington Avenue, New York 17, N. Y.*

311-95

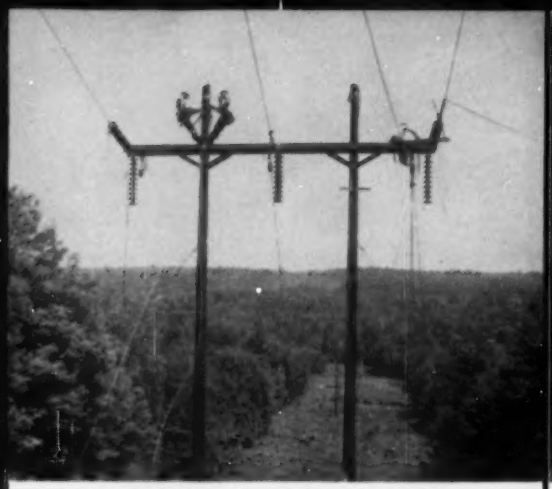
Call Graybar first for...

Everything Electrical GraybaR ELECTRIC COMPANY

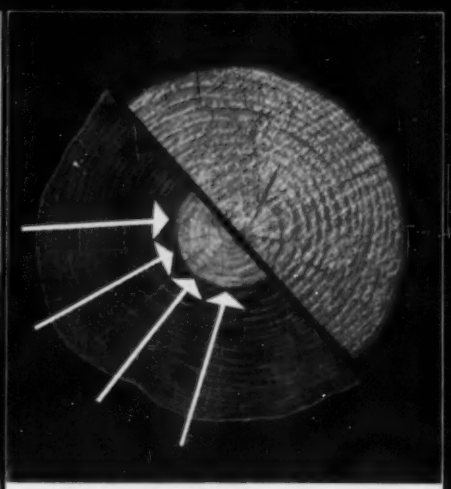
IN OVER 100 PRINCIPAL CITIES

Another utility case history

Clean Penta-preserved poles won't stain or bleed



PUBLIC SERVICE CO. OF NEW HAMPSHIRE specifies clean Penta protection for western red cedar poles, Douglas fir crossarms. Since 1951, this company has used Penta-treated wood to resist decay and wood-boring insects. Penta gives wood installations at least 4 times longer life.



PENTA GOES DEEP! Cross-section of two poles—Penta-treated at left, untreated at right—shows depth of Penta penetration. Penta effectiveness is as high after 20 years as it is after one month. Penta provides lasting economy!

PENTA PROTECTS WORKMEN, TOO! Penta stays put, will not bleed or leach out of wood. Penta-treated wood is clean, does not "burn" hands or stain clothing and, when properly treated, it is odorless.

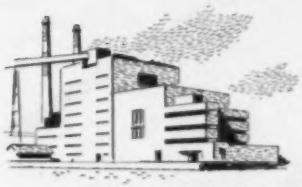
SPECIFY PENTA for POLES, CROSSARMS, TRANSFORMER PLATFORMS, BRACES, CONTROL BOXES, PLANKING. More than 85 treating plants will apply Penta for you. Write us for this list, and for "Poles and Crossarms" booklet. Organic Chemicals Division, MONSANTO CHEMICAL COMPANY, Box 478-T-2, St. Louis 1, Missouri.

MONSANTO
CHEMICALS – PLASTICS

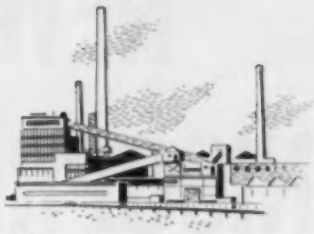
SERVING INDUSTRY... WHICH SERVES MANKIND

6 new units in 6 years

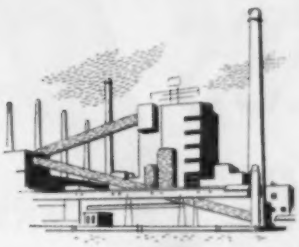
for New England Electric System



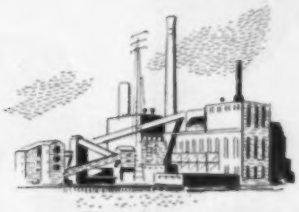
Salem Harbor Station in Salem, Mass.
Two 60,000 kw. units — '51 & '52



Webster St. Station in Worcester, Mass.
30,000 kw. unit — '50



South Street Station in Providence, R. I.
55,000 kw. topping unit — '53



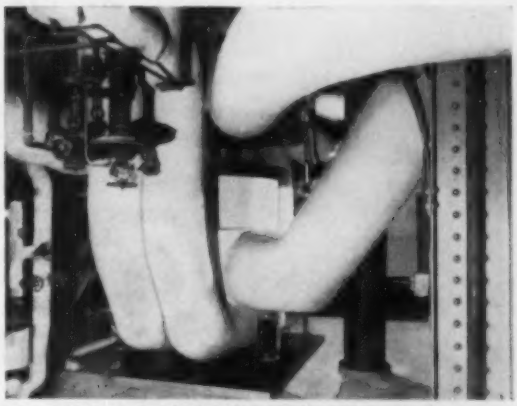
Manchester St. Station in Providence, R. I.
Two 40,000 kw. units — '48 & '49

Proof of the reliability of GRINNELL PREFABRICATED PIPING

Here's a clear-cut case of the value of choosing the right power piping fabricator *from the start!* New England Electric System, when launching its power expansion program, called in Grinnell. Satisfied that Grinnell's facilities rated very high, they okayed Grinnell Prefabricated Piping for the first of a series of new steam-electric generating units. The "proving ground" was to be the unit itself *in service.*

How efficiently that unit performed is written in the record! For starting in 1948, and then each year for 5 consecutive years, Grinnell Prefabricated Piping was employed *exclusively* in constructing 6 new units in the New England Electric System.

This special ability in the fabrication of piping is due to a number of things. Grinnell fabricates in shops under ideal conditions, with modern equipment, by personnel qualified for each class of work. Included in the price (which is determined in advance) are such items of expense as: interpretive engineering, shop sketches and planning, procurement of materials, power services, expendable tools and supplies. There are no charges for waste material or spoilage. All piping is rigidly inspected and tested to comply exactly with customer specifications and applicable codes. Consult Grinnell on *your* next piping installation.



Main steam and reheat lines at reheat intercept valve, Salem Harbor Station.

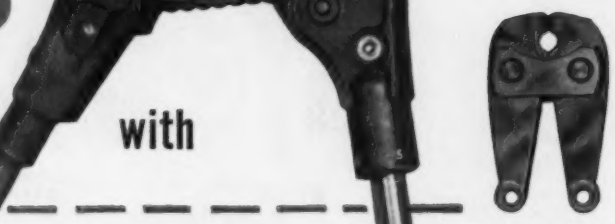
ATTENTION! *Company Groups and Technical Associations. A 30-minute color sound film showing the quality and economy of Grinnell Shop Fabrication of all classes of piping is available. Write us, giving date desired.*

GRINNELL
WHENEVER PIPING IS INVOLVED

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves
Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies
industrial supplies • Grinnell automatic sprinkler fire protection systems • Amco air conditioning systems

NEW NICOPRESS NO. 88 TOOL with



INTERCHANGEABLE HEADS ARE QUICKLY ATTACHED

INTERCHANGEABLE HEADS

● This mechanical tool develops tremendous power by a combination of compound leverage and progressive ratcheting action. A few short strokes of the easy-working handle produce the powerful jaw pressure necessary to assure dependable full-tension splices.

Quickly-changed tool heads permit splicing a wide range of larger conductors. Write for Bulletin 88.

NICOPRESS . . . the tool and the sleeve that are made to work together . . . *together* they make the perfect splice.

Nicopress Sleeves and Tools Patented in U.S. and Foreign Countries. "Nicopress" Registered in U.S. and foreign countries.

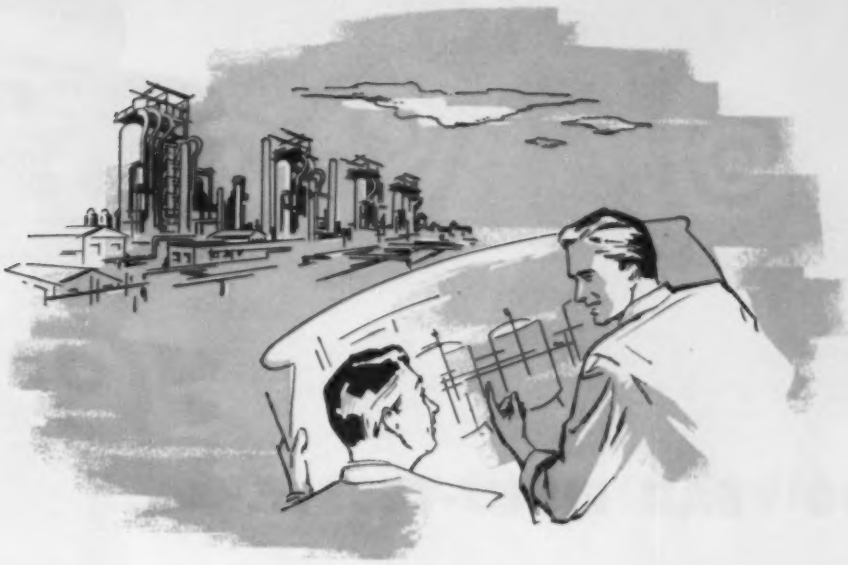
The National Telephone Supply Company

5100 SUPERIOR AVENUE • CLEVELAND 3, OHIO

Canadian Mfr.: N. SLATER CO., LTD., HAMILTON, ONTARIO, CANADA

Export Distributor: INTERNATIONAL STANDARD ELECTRIC CORP., NEW YORK, N. Y.

THE NATIONAL TELEPHONE SUPPLY COMPANY



HIGHER WATER PURITY BY DEMINERALIZATION

...A Cochrane Achievement

Long experience with *all* phases of water conditioning problems places Cochrane in the position of leader in the design and application of equipment to meet the exacting requirements of demineralization.

Cochrane Demineralizers now operating on boiler feed and process waters are continuously producing effluents with total dissolved solids and silica residuals approaching zero, within the limits of accuracy of available testing methods. These include 2-bed, 3-bed and 4-bed systems—compact mixed bed units—manually controlled or automatically operated.

Cochrane engineers and manufactures every type of ion exchange precipitation type water conditioning equipment—which assures you of unbiased recommendations for equipment best suited to your requirements. Its complete service provides single responsibility for engineering, fabrication and continued satisfactory operation.

For information on Cochrane Demineralizers, write for Publication No. 5800 and reprints on demineralization.

Other Cochrane Processes

HOT PROCESS SOFTENER

Highly efficient precipitation at high temperatures reduces hardness, silica, alkalinity and total dissolved solids. Publication No. 3000.

HOT ZEOLITE SOFTENER

Supplementing the Hot Process Softener, high temperature ion exchange resins completely remove residual hardness with substantial savings in soda ash and phosphate. Publication No. 4801.

SOLIDS CONTACT REACTOR

Slurry blanket principle efficiently removes solids, turbidity, color, taste, silica, fluorides; reduces alkalinity and hardness from water for boiler feed industrial process and municipal purposes. Publication No. 5001-A.

C100.7

COCHRANE CORPORATION
3146 NO. 17TH ST., PHILA. 32, PA.

Send me a copy of Publication Nos. 5800, 3000, 4801, 5001-A, Reprints of Technical Articles. (Circle publication desired).

Name_____ Title_____

Company_____

Address_____

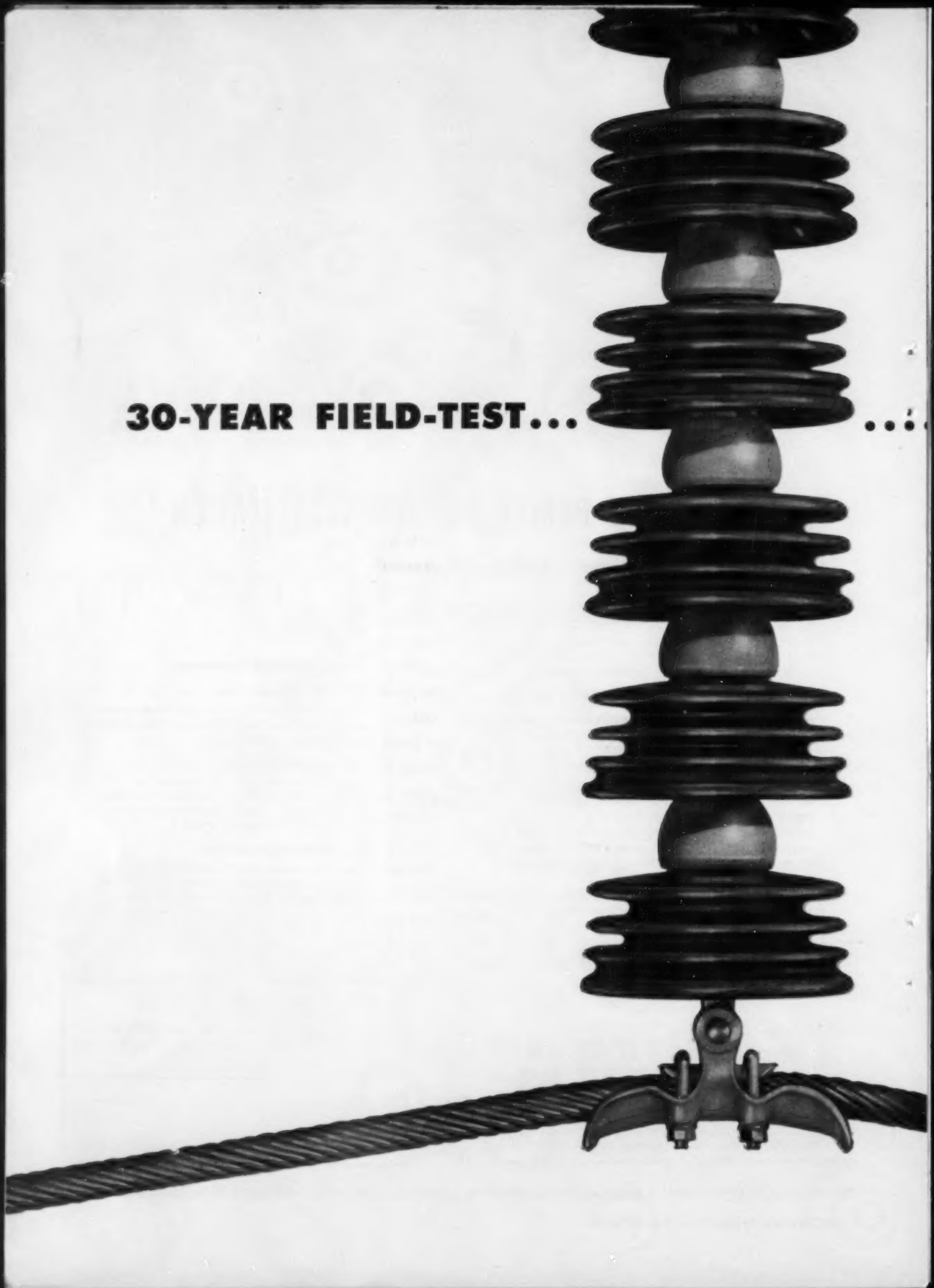
City_____ Zone____ State_____

Cochrane
CORPORATION

3146 NO. 17th STREET, PHILADELPHIA 32, PA.
NEW YORK • PHILADELPHIA • CHICAGO
Representatives in 30 principal cities in U. S., Toronto, Canada, Mexico City, Mexico, Paris, France, Havana, Cuba, Caracas, Venezuela, San Juan, Puerto Rico, Honolulu, Hawaii.
Pottstown Metal Products Division—Custom built carbon steel and alloy products

Demineralizers • Hot Process Softeners • Hot Zeolite Softeners • Dealtalizers • Reactors • Deaerators • Continuous Blow-Off • C-S Systems • Specialties

30-YEAR FIELD-TEST...



....PROVES LAPP FOG-TYPE DESIGN

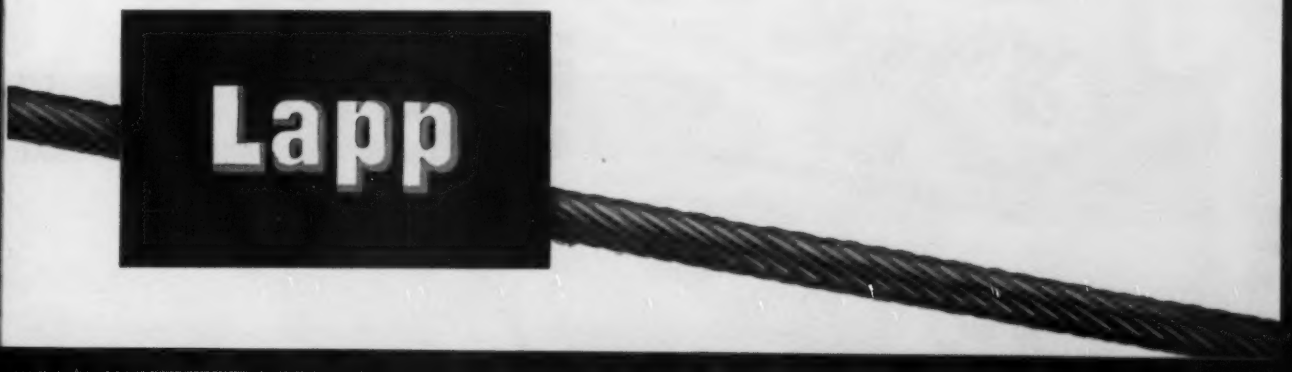
In 1924, the Lapp Fog-Type suspension insulator was designed and first put into service. The design has remained virtually unchanged for the 30 years. It is the "standard" for successful performance in dirt conditions—every "fog-type" insulator which has ever won acceptance or achieved continuity of production has been based on the same principle of multiple short petticoats providing *exposed* leakage path.

Successful application of this design principle for contamination problems has been by no means limited to suspension discs. It is a primary design consideration of the Lapp Line Post and Station Post insulators—and one basic reason for the superior operating performance of these units for line and station duty. Such fog-type surfaces have become standard, too, for high-voltage bushings, which, with nearly all of their surfaces exposed, traditionally "get by" with shorter leakage distances than are required of switch and conductor insulators in the same stations.

There are, of course, sound reasons for the superiority of the *exposed* leakage path. In the first place, it provides a *uniform* leakage path, avoids concentrated hot-spots where local stress can precipitate flashover. Also, Lapp Fog-Type corrugations are self-cleaning. A maximum of the surface area is exposed to rain and wind which flush off contamination, to increase resistance and reduce leakage current.

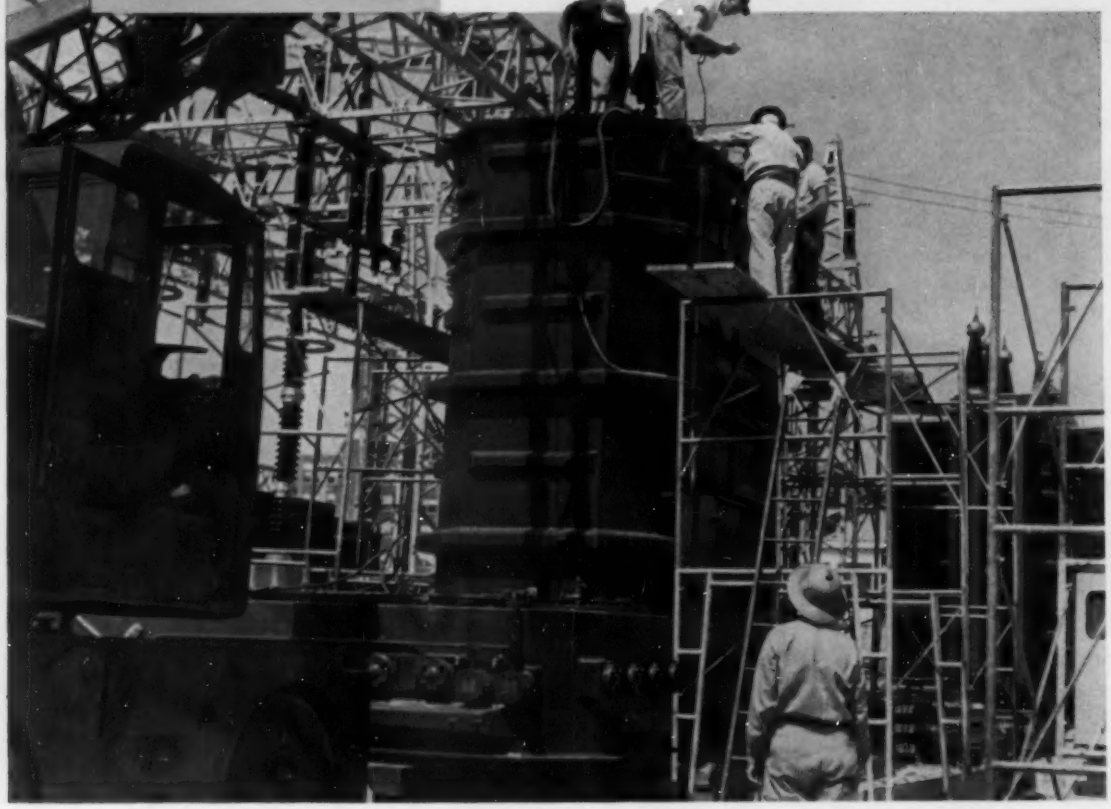
For transmission duty in contaminated atmosphere, Lapp Fog-Types offer a *proved* record of operating security, long life and low upkeep.

Lapp Insulator Co., Inc., Le Roy, N. Y.



Wagner®
TRANSFORMERS
...the choice of leaders in industry

...to help meet today's power



Everyday, everywhere, the electric utility industry is adding to its facilities to meet today's growing power needs.

In Memphis, Tennessee—the Memphis Light, Gas & Water Division recently completed the installation of two new Wagner 25,000/33,333 kva, 3 phase, 60 cycle power transformers at its new Adams Street sub-station.

Two additional Wagner transformers of the same rating are located at Woodstock, Tennessee—making a total of four such units installed by this company to enable it to better serve Memphis and the surrounding area.

These four new transformers mean plenty of additional power for a growing Memphis and its citizens who are using more and more electricity every year.

That Wagner Transformers were chosen points up the fact that more and more electrical utilities are looking to Wagner for their transformer needs.

And why not? Wagner has been serving the power industry for over sixty years. Utilities like the design of Wagner Transformers. They know that Wagner Transformers are built with great care to give them inherent strength and stability... and that they have

WAGNER ELECTRIC CORPORATION
6456 Plymouth Ave. • St. Louis 14, Mo., U. S. A.

Wagner Electric Corporation EST. 1891

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS — AIR AND HYDRAULIC

BRANCHES IN 32 PRINCIPAL CITIES

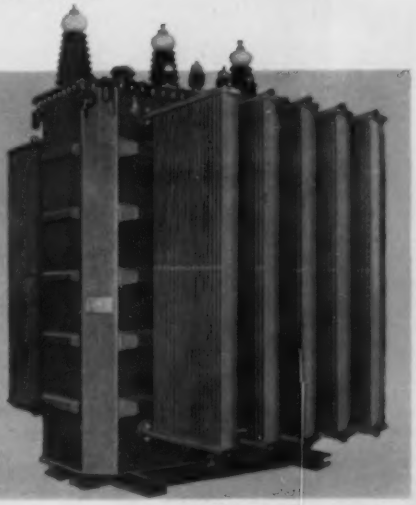
T55-5

needs in Memphis, Tennessee

To facilitate the installation of these Wagner Transformers, one of Wagner's specially-equipped transformer service trucks was used at the work site. Wagner field service engineers helped supervise the installation.

sufficient capacity to carry not only their rated loads, but to handle overloads when emergencies arise.

Why not consider Wagner Transformers for your next installation? 32 branch offices are maintained for quick, convenient engineering service and consultation. Write for Bulletins TU-180 and TU-181. They give full information on Wagner Power and Distribution Transformers.



If you need power transformers rated 10,000 kva and below, three phase—or 5,000 kva and below, single phase—why not check ASA C57.12a Standards and use them as your specifications? In addition to saving the cost of preparing specifications, you will also realize a substantial saving in price by using Wagner Standard Transformers.

Who Wants to Measure 2,000,000,000,000 ohms?

The answer . . . every manufacturer and user of electrically-operated equipment. In short, nearly everyone is interested in the measurement of high resistance — for this is the key to efficient, convenient PREVENTATIVE MAINTENANCE.

The versatile G-R Megohmmeter can be used to: insure safe insulation and the absence of shock hazard; to determine the extent of deterioration, corrosion or moisture absorption. The instrument is used by hundreds of leading manufacturers for determining insulation damage in wiring, cabling, motors, generators, transformers, bushings, switches and other equipment using insulation.

The Megohmmeter also finds application in the production testing of electrical apparatus, lighting systems, portable tools, electronic components, wire and cables of all types, and all sorts of rotating machinery. The instrument is invaluable at the time of assembly and installation.

The Megohmmeter is easy to operate — resistance measured is merely the product of meter reading and "Multiplier" switch setting. This instrument is ruggedly designed to withstand the rigors of field use.

- ★ Very Wide Range — 0.5 megohm to 2,000,000 megohms.
- ★ Convenient, Expanded Meter Scale — 90% of meter is used for each of the following multiplier settings: 1, 10, 1000, 10,000, and 100,000.
- ★ Voltage Automatically Applied to Unknown — 50 volts or 500 volts as selected by switch.
- ★ Accuracy — from ±3% for low resistance readings to ±12% for high resistances on 500-volt operation; ±5% to ±14% on 50-volt operation.
- ★ Compact and Light Weight — approximately 10" x 9" x 12"; only 15¼ pounds.
- ★ High Voltage Protection — all terminals thoroughly insulated; voltage can be removed from terminals for safe connections.
- ★ Guard Terminal Provided — for three-terminal measurements.
- ★ Internal Calibrating Circuit — accuracy of 500-volt calibration insured.

Type 1862-B Megohmmeter . . . . . $225.

We Sell DIRECT
Prices Shown are NET, fob Cambridge, Mass.

GENERAL RADIO Company

275 Massachusetts Avenue, Cambridge 39, Massachusetts, U.S.A.

90 West Street NEW YORK 6
6605 11th St., Silver Spring, Md. WASHINGTON, D.C.
920 S. Michigan Avenue CHICAGO 5
1000 N. Seward Street LOS ANGELES 38

GR 1915-1955 40 Years of Pioneering in Electronics

"BIG ROCKER"

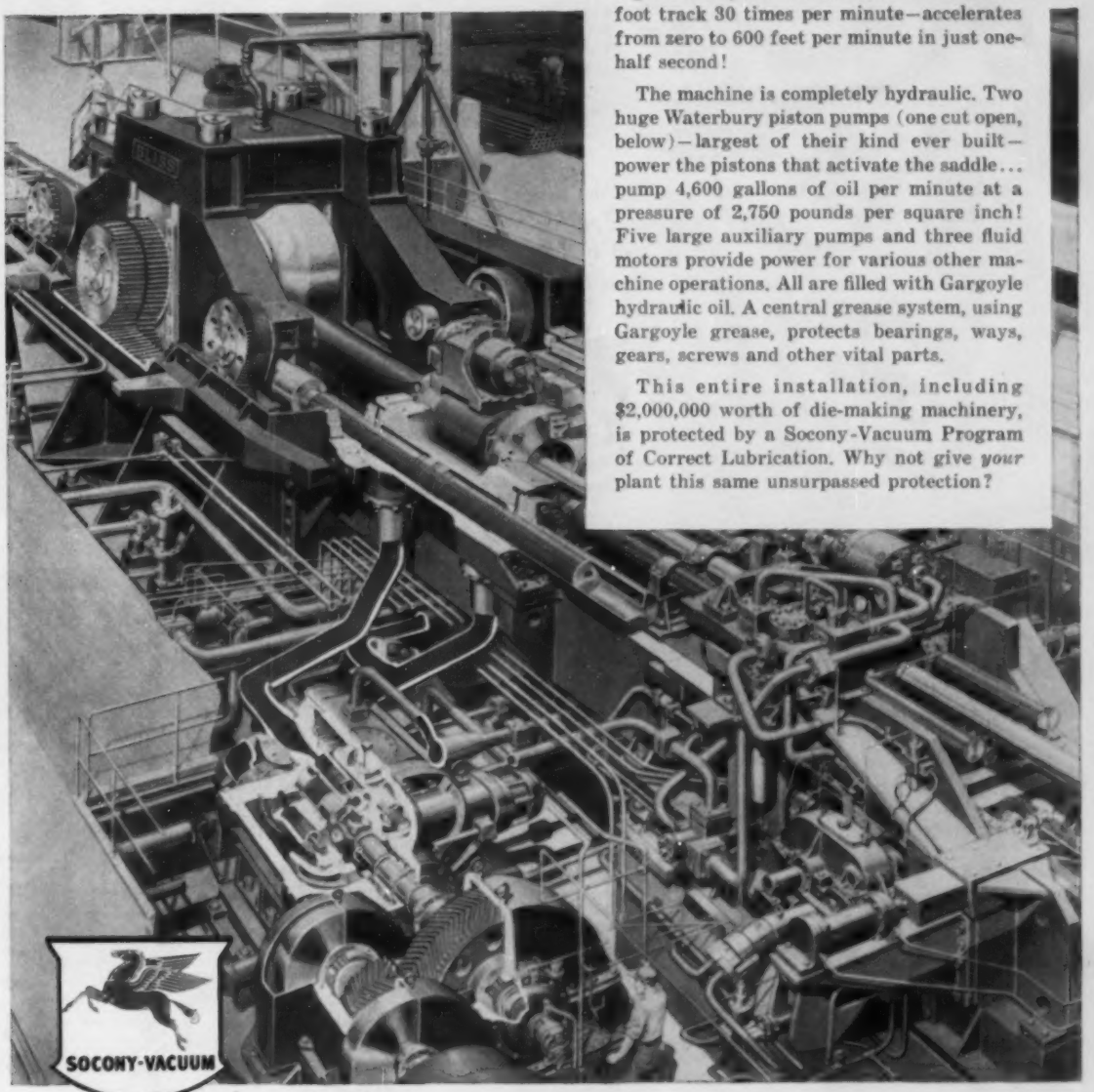
World's Largest Tube Reducing Machine Protected by the World's Greatest Lubrication Knowledge

It's 100 feet long, three stories high, weighs 675 tons! It's the world's largest tube reducing machine, built by E. W. Bliss Co., for the Tube Reducing Corp., Wallington, N. J. This giant takes rough, 18-inch O. D. cold steel tubing and reduces it to between 17- and 9-inch tubing. Finished tolerances are precise.

Heart of the Big Rocker is the "saddle" (top) which holds the huge dies that shape and stretch the tubing. This saddle, weighing 152 tons, rocks back and forth on a six-foot track 30 times per minute—accelerates from zero to 600 feet per minute in just one-half second!

The machine is completely hydraulic. Two huge Waterbury piston pumps (one cut open, below)—largest of their kind ever built—power the pistons that activate the saddle... pump 4,600 gallons of oil per minute at a pressure of 2,750 pounds per square inch! Five large auxiliary pumps and three fluid motors provide power for various other machine operations. All are filled with Gargoyle hydraulic oil. A central grease system, using Gargoyle grease, protects bearings, ways, gears, screws and other vital parts.

This entire installation, including $2,000,000 worth of die-making machinery, is protected by a Socony-Vacuum Program of Correct Lubrication. Why not give *your* plant this same unsurpassed protection?



SOCONY-VACUUM *Correct Lubrication*

FIRST STEP IN CUTTING COSTS

SOCONY-VACUUM OIL COMPANY, INC., and Affiliates: MAGNOLIA PETROLEUM COMPANY, GENERAL PETROLEUM CORPORATION

Dependable

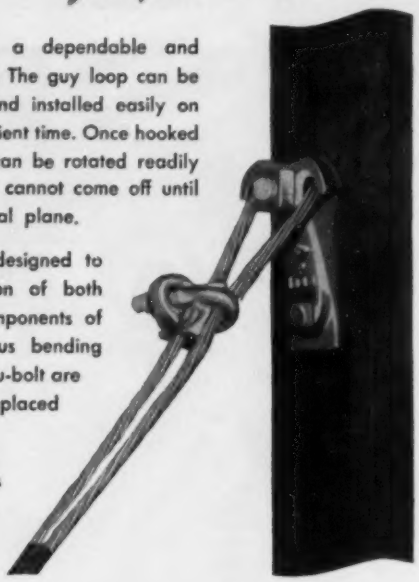
MIF GUY HOOKS

Never let a guy down!

Loop securely retained.

Guy at any angle up to 90° with pole.

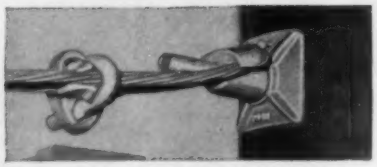
- **M.I.F. Guy Hooks** are a dependable and economical guy attachment. The guy loop can be made up on the ground and installed easily on the Guy Hook at any convenient time. Once hooked over one of the "ears", it can be rotated readily into its proper position and cannot come off until again turned to a horizontal plane.
- **M.I.F. Guy Hooks** are designed to transmit a large proportion of both vertical and horizontal components of the load to the pole. Thus bending and shear stresses on the thru-bolt are minimized and the bolt is placed chiefly in tension.
- **Each M.I.F. Guy Hook** is a single malleable iron casting, hot dip galvanized.



Wedge resists vertical movement; permits high- or initial tension on thru-bolt.

Spurs add to vertical stability.

Light duty Guy Hook for down, span and arm guys. Also a House Bracket. Reduces inventory.



P137 Series for dead ending arm and head guys, and messengers, at any angle to 30° with the horizontal.

Channel back provides better fit on poles.

Wide heel pad provides maximum resistance to overturning.

SPECIFICATIONS

Cat. No.	Maximum Bolt Dia.	Maximum Strand Dia.	Thimble Dia.	Approx. Shipping Wt. Lbs./C.
Guy Hooks				
P135B	⅝"	⅝"	1¾"	45
P135A	⅝"	¾"	1⅞"	110
P133A	⅝"	½"	1⅞"	136
P132C	¾"	¾"	2⅛"	275
P132B	1"	¾"	2⅛"	275
Span Guy Hooks				
P137	① ⅝"	½"	1⅝"	69
P137A	② ⅝"	½"	1⅝"	70
P137B	② ¾"	½"	1⅝"	68
P137C	① ¾"	½"	1⅝"	67

① Clearance hole. ② Tapped hole.

MALLEABLE IRON FITTINGS CO.

Pole Hardware Division — Branford, Connecticut

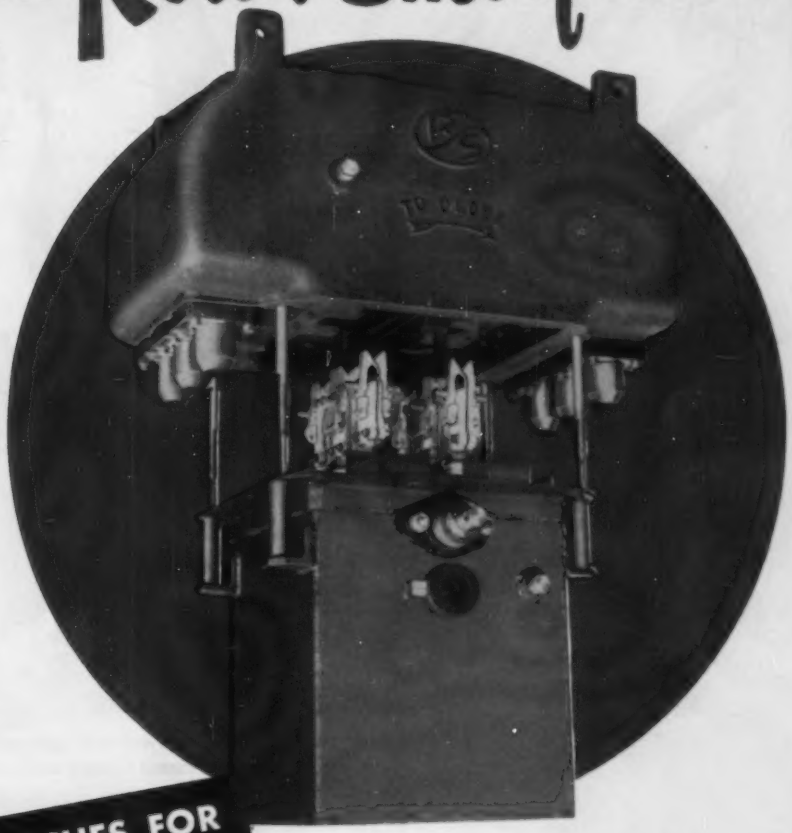
N.Y. Office: 30 Church St. — Boston Office: 250 Stuart St.

Canadian Mfr. & Dist.: LINE & CABLE ACCESSORIES, Ltd. TORONTO

Representatives: William J. Cottrell Co., Portland, Ore. • James H. Drew Corp., Indianapolis, Ind. • Industrial Engr. & Equip. Corp., Los Angeles, Cal. • JSG Electric Co., Chicago, Ill., Lee-Smith Co., Miami, Fla. • B. H. McCoin, Knoxville, Tenn., • William J. O'Brien, Memphis, Tenn., • Robert P. Smith & Co., Jacksonville, Fla., E. A. Thorwell, Inc., Atlanta, Georgia • J. P. Voight, Summerville, S.C. • Waltham, DeWitt & Krusi, San Francisco, Calif. • L. G. Wendegatz, Kansas City, Mo. • Williamson Sales Co., Shreveport, New Orleans, La.; Dalas, Houston, Tex. • O. C. Witte Co., Detroit, Mich.

Favorite of Engineers Everywhere . . .

THE FAMOUS Roller-Smith "SUBWAY SWITCHES"



OIL SWITCHES FOR UNDERGROUND ELECTRICAL DISTRIBUTION SYSTEMS

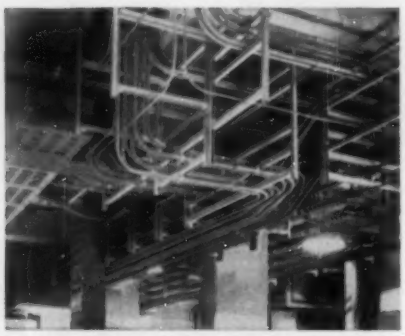
Roller-Smith "Subway Switches"—so-called because they are used in many kinds of underground electrical distribution systems—deliver outstanding performance for several important reasons.

Draw-out construction permits the switching mechanism and tank to be removed or replaced without disconnecting the load cables. This assures safety in servicing because an interlock prevents removal or insertion of switching mechanism with switch in the "closed" position. All switches will safely interrupt twice their current rating. Construction is water-tight and switches may be operated even though submerged. An electrically-operated model (MS-1A) is available in weather-proof construction for pole or bracket mounting. "Subway Switch" Model MS-1 is rated 400 amperes, 4160 volts. Model MS-5 is rated 600 amperes, 13,800 volts. "Subway Switches" offer the same high quality, long life, and assured continuity of service that characterize the many other Roller-Smith products serving the electrical industry.

Roller-Smith
CORPORATION
ELECTRICAL SWITCHGEAR
BETHLEHEM, PENNSYLVANIA

SALES REPRESENTATIVES IN ALL PRINCIPAL CITIES—CANADIAN AND FOREIGN

Somebody picking your pockets?



Installing close runs is easier, especially in awkward places, with Republic ELECTRUNITE E. M. T. Since every coupling is a union, joints are easily made without turning the whole run. Intricate runs are easily duplicated.

At least, your electrical conduit installations may be costing you more extra dollars than necessary.

HERE IS THE MODERN, STEEL ELECTRICAL RACEWAY THAT LASTS AND LASTS. In some utilities, it's been on the job more than 15 years, and still going strong.

HERE IS THE RACEWAY THAT GIVES YOU PROTECTION. The protection of steel *plus* unbroken galvanized coating from end to end. No threads to cut. No lines to turn. You get cost savings as well as the protective features.

HERE IS THE RACEWAY THAT SAVES ON INSTALLATION COSTS. Because it's lighter, there's less weight to handle. "Inch-Marks"® on the popular sizes help make accurate bends to fit in close quarters, even where there are multiple bends. Installation is easy, even though equipment has already been installed.

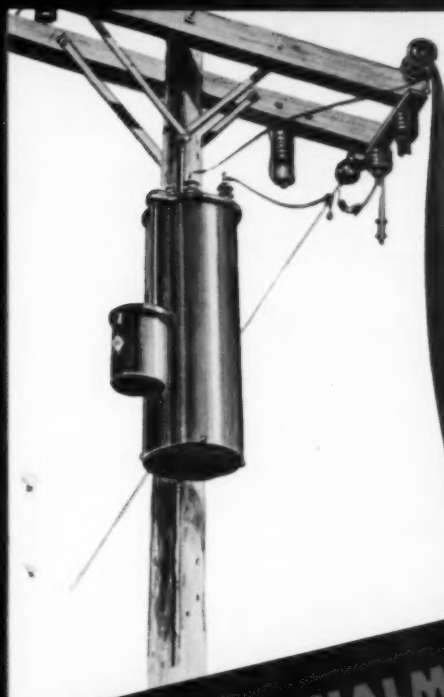
Check the costs and advantages. Protect your pocketbook. Specify Republic "Inch-Marked" Electrical Metallic Tubing for your new building program. For modernizing, too. It's produced to A.S.A. Specification C80.3, Federal Specification WW-T-806 and is Underwriters' Laboratories inspected. Write for all the facts. K-5011

REPUBLIC STEEL

STEEL AND TUBES DIVISION • 213 EAST 131st STREET • CLEVELAND, OHIO

World's Widest Range of Standard Steels and Steel Products

Made by the producers of ELECTRUNITE...The Original Electric Welded Boiler Tube



Carry twice the load

ALLIS-CHALMERS

5/8% STEP VOLTAGE REGULATORS

with present Wire

Little Extra Cost

Here's how: Use all the copper in your line to carry load. Most lines have extra copper to take care of voltage drop. You'll no longer need this provision when Allis-Chalmers distribution regulators control voltage automatically.

Doubling the load doubles the voltage drop. On a line with 10% voltage drop, increasing the load 100% makes the voltage drop 20%. Then, utilizing the ± 10% range of an Allis-Chalmers voltage regulator, you bring the voltage drop back to 10% again.

REGULATORS ARE ALL YOU BUY

Capital expense is held to a minimum. All you buy is low-cost Allis-Chalmers distribution regulators. No wire to buy, no costly labor charges. In addition, you will get close voltage control, which results in higher revenue and fewer voltage complaints for your system.

ALLIS-CHALMERS

A-4614

A-C ALLIS-CHALMERS

Originators of 5/8% Step Regulation

To get more facts on the regulator that can do the job, turn the page.

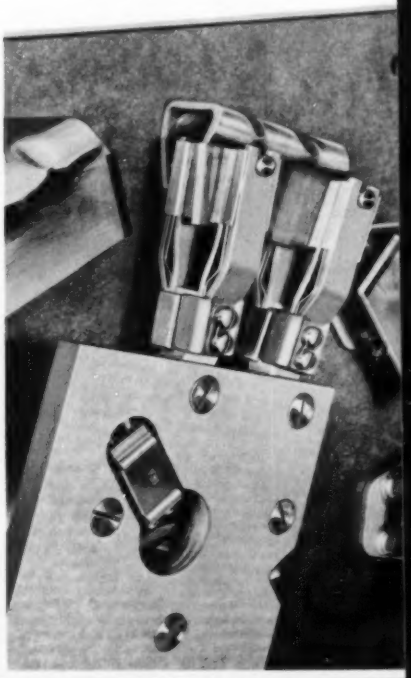
To Double the Loads

use the

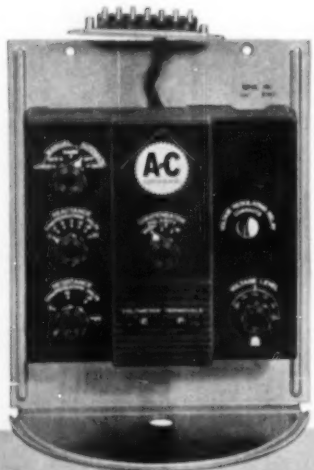
ALLIS-CHALMERS

5/8% STEP VOLTAGE REGULATORS

Designed and Built



Simple Design for Control Accuracy



Feather-Touch control on Allis-Chalmers distribution regulators gives you ± 1 volt band, Class 1 accuracy. Friction can never upset accuracy because the floating beam of the regulating relay eliminates the need for a mechanized bearing. You are assured of accuracy over the life of the regulator.

You get ease of installation and operation. Key adjustments are preset at the factory. Your operating men have a minimum of adjustments during installation. And it's easy to make the few settings that are needed with the large, easy-to-read calibrations.

A-C ALLIS-CHALMERS

ALLIS-

with Present Circuits

Regulator with Proved Reliability

Thousands of installations, more than ten years of field operation show why Allis-Chalmers distribution regulators are the logical choice for load-expanding assignments. No other distribution regulator now on the market can match their combination of proved service life and high quality.

▶ Here's what you get with Allis-Chalmers distribution regulators: a narrow ± 1 volt band, thirty-two small ⅝% steps, ± 10% range of regulation, easy control adjustment, close average voltage maintained by voltage integrator, and long-life unit construction.

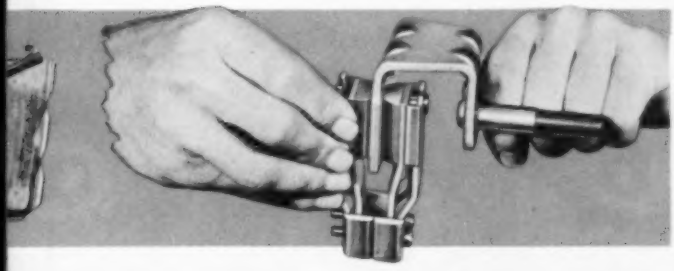
Not only for load-expanding assignments but for every voltage application you'll find Allis-Chalmers distribution regulators will cut costs, increase profits. Join the hundreds of distribution engineers who prefer Allis-Chalmers. Call the nearby A-C office for information.

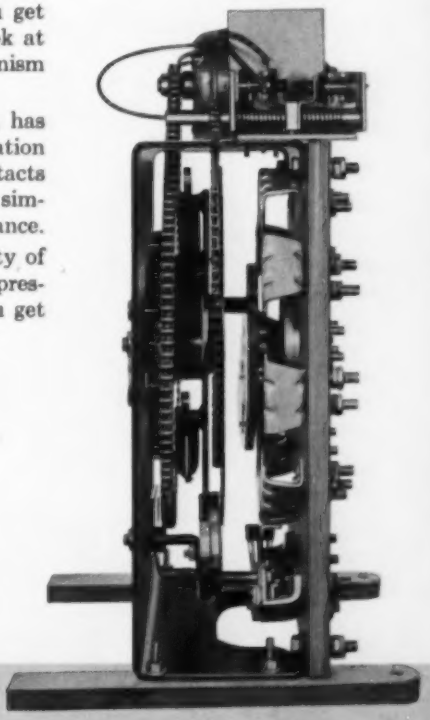
for Long Life, Low Maintenance

▶ At low cost, in Allis-Chalmers distribution regulators you get rugged, simple design and highest quality construction. Look at the mechanism: it is the same famous *Quick-Break* mechanism used on Allis-Chalmers voltage regulators for over 20 years.

This unit has withstood over five million test operations, has been proved in thousands of field installations. Only operation can show how its rugged design complements the large contacts and heavy contact pressure, but the photo does show the simplicity that results in reliable operation, simplified maintenance.

A close look at the contacts on the dial switch shows plenty of arc-resisting material for extra-long operating life. Contact pressure is so strong you can't pull contacts apart. Result: You get long contact life with low maintenance.





CHALMERS MILWAUKEE 1, WISCONSIN

Low-cost regulation *For Substation or Feeder*

Allis-Chalmers distribution regulators are the low-cost, high-quality answer to almost any regulator problem. They give you highest quality features of regulation combined with low cost and flexibility of installation. Use them either out on the line or in a substation. If load conditions change, moving them to another location is simple and low in cost.

Buy Voltage Insurance

Many utilities find that Allis-Chalmers distribution regulators give permanent insurance against low voltage. Their flexibility makes it possible for them to earn their keep many times over, not only at the place they were originally installed but on other feeders as well.

Increase Revenues Now

Here's why it will pay you to get all the facts immediately: Allis-Chalmers distribution regulators increase revenue—and profits—on any system where voltage may be low. As loads increase the profit possibilities of adding regulation increase in proportion. The way to assure these profits is to investigate Allis-Chalmers distribution regulators now and apply them where needed.

Call your nearest A-C district office or write Allis-Chalmers, Milwaukee 1, Wisconsin, for complete information.

ALLIS-CHALMERS

Originators of 5/8% Step Regulation

A-C ALLIS-CHALMERS

Remington Rand

BETTER BUSINESS METHODS

For Greater Profits Through Lower Costs

Kardex — The Heart of Fast and Accurate Handling of Customer Calls for Service

Service Order Cards with space for recording four different occupants or eight orders for service, are filed by address. Each card carries up-to-date "premise" data, enabling completion of order while the customer is still on the phone.

"Blind," multiple-copy order taking is eliminated. Service is speeded. Costs are reduced. Public Relations are tops!

Booklet X1498 contains posted samples of all forms plus action shots of actual installations. Be sure to ask for your copy.

New Sectional Customer Service Counter Desk for Cashiering and Cashiering-Bookkeeping Offices!

The friendly appearance of customer service counter creates pleasant customer relations. It includes the three-way convenience of a sectional, easily moved counter, a certified safe and a functional work desk...all in one.

Customer transacts business easily and comfortably. Continuous parcel shelf permits the customer just served to move aside for the next in line.

Cashiering is speeded up because complete facilities are at hand, with records protected against fire 24 hours-a-day.

Ask for booklet SC764. It contains ideas that can be profitable for the small or large office.

Improve Collections... Reduce Bad Debt Losses... with a Centralized Kardex Customer History Record

This record combines in a single reference:

1. *Alphabetical Index to all Customers*
2. *Security Deposit Ledger*
3. *Inactive Account Ledger*
4. *Bad Debt Ledger*
5. *Unclaimed Deposits Ledger*
6. *"By-Passing" Record*
7. *Collection Efforts Record*
8. *Merchandise Repossessions*
9. *Deposit Interest Payments*
10. *Non-Pay Cut-Offs*
11. *N S F Checks*
12. *Special Credit List*

The Kardex Customer History Record provides speedy, accurate information about all customers while eliminating several separately maintained records.

Ask for booklet X1498 which gives you a "Good Look" at Public Relations in ACTION.

Remington Rand

Room 1376, 315 Fourth Ave., New York 10

Please see that I have FREE brochure(s) circled.

X1498 SC764

Name & Title_____

Firm_____

Address_____

City_____ Zone____ State_____

U-2

Profit-Building **IDEAS** For Business

Never leave dependability out of your fuel picture

A sailboat has no choice—it must depend upon an undependable wind for locomotion. Fortunately, you have a choice in fuels for your firing system. Select the fuel known for *complete* dependability—Bituminous coal! It's the one fuel which gives you:

Dependability of Supply—Bituminous coal provides, for centuries to come, an inexhaustible source of low-cost heat and energy. The vast Bituminous fields served by the B&O contain a great variety of outstanding coals for every purpose.

Dependability of Cost—Cost is kept low and stable thanks to the advancements made by modern mechanized mining. And coal is economical and safe to store.

Call on our Coal Technical Service! You will receive authoritative information on how to select the right Bituminous coal for your specific firing job . . . how to make the most of your fuel dollar. *Ask our man!*

Write: COAL TRAFFIC DEPARTMENT
BALTIMORE & OHIO RAILROAD
BALTIMORE 1, MARYLAND

BITUMINOUS COALS FOR EVERY PURPOSE

BALTIMORE & OHIO RAILROAD
Constantly doing things—better!

LINKING 13 GREAT STATES WITH THE NATION
B&O

Overload indicator is quickly and easily reset by simply pushing indicating light socket up.

The L-M Transformer Overload Indicator is easily installed on transformers in service. It is secured to the transformer tank wall by a stainless-steel zigzag wire wrapped around the tank.

Maintain High Service Continuity With

L-M's New Ambient-Temperature-Compensated Overload Indicator

Accurate, economical, easy to install on transformers in service; measures tank wall temperature; provides continuous overload check without interrupting service.

W. H. ENGLAND
Application Engineer
Protective Equipment Division
Line Material Company

Line Material engineers have recognized the need for an accurate yet economical overload indicator to eliminate the costly and laborious task now required for load checking. In addition, conventional type transformers with overload indicators will eliminate the costly expense of resetting the secondary breaker on protected transformers.

We have therefore developed an indicator that assures positive overload indication, amply meets thermal, mechanical, and economical requirements, and does not interrupt service to customers.

The overload indicator is a tool which you can utilize extensively to obtain and maintain a high continuity of service. It will enable you to keep your hand on the pulse of your distribution load.

Compensates for Ambient Temperature

The device indicates thermal overloads accurately. It measures tank wall temperature (a function of top oil and hot-spot temperatures), and makes proper allowance in transformer loading for variations in ambient temperature.

The indicator is easily installed on transformers in service. It is secured to the transformer tank wall by a stainless-steel zigzag wire wrapped around the tank. On new L-M Round-Wound® transformers from the factory, the indicator is attached to a strap permanently welded to the transformer tank.

Illuminated Target

When the indicator reflects a transformer overload condition, a tube target drops, exposing and energizing a red light. The light is readily discernible in daylight as well as at night.

The indicator target is also available wrapped with reflecting tape, which is exceptionally brilliant and easily distinguished. This indicator without the red light does not require an electrical connection to the transformer.

Low Cost; Pays for Itself

The cost is low. The indicator will quickly pay for itself through reduction in transformer burnouts and elimination of load checks.

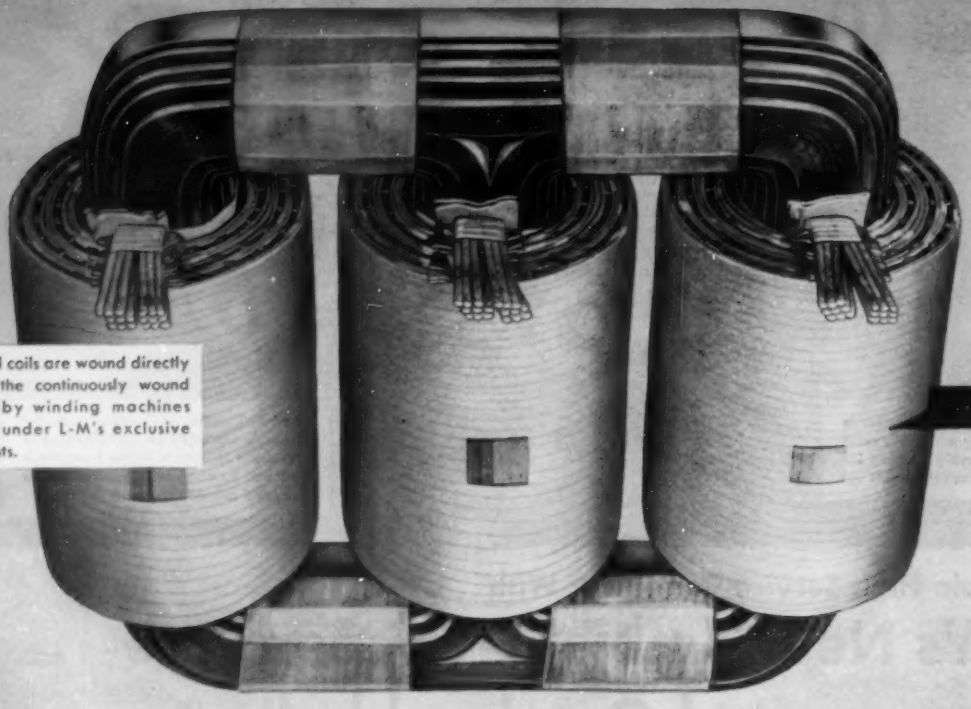
Get information on the L-M overload indicator today. Ask the L-M Field Engineer for bulletins and complete information; or write Line Material Company, Protective Equipment Division, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

Illuminated target affords positive overload indication which is easily seen during the day or night.

L-M Transformer Overload Indicator in normal and overload indicating positions. The metallic tank wall heat receiver is semi V-shaped to fit on any size or shape of tank.

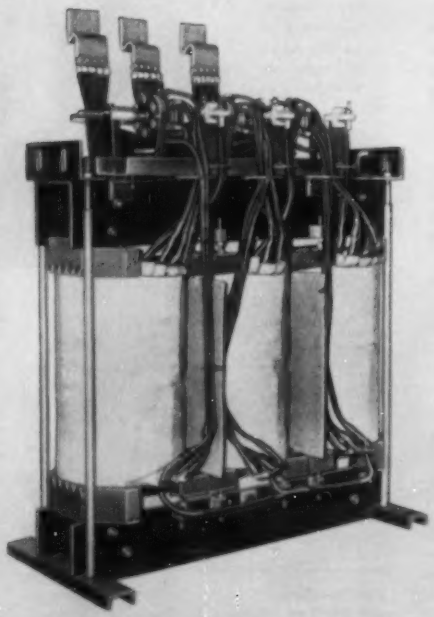
209

LINE MATERIAL *Protective Equipment*

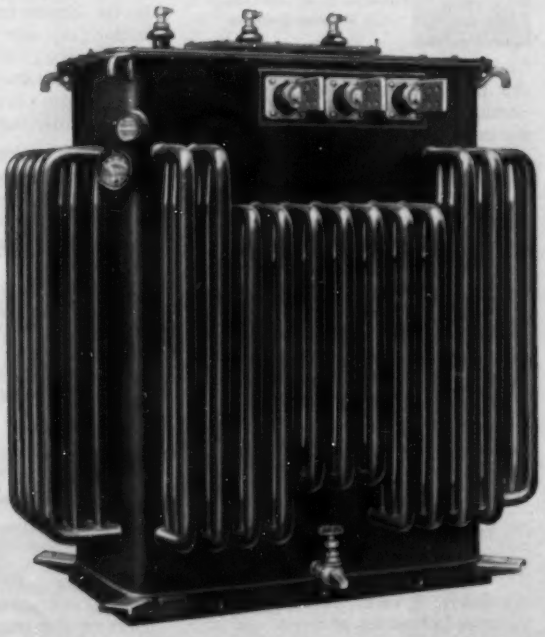


Round coils are wound directly onto the continuously wound core by winding machines built under L-M's exclusive patents.

L-M Announces New Uni-Wound℠ 3-Phase

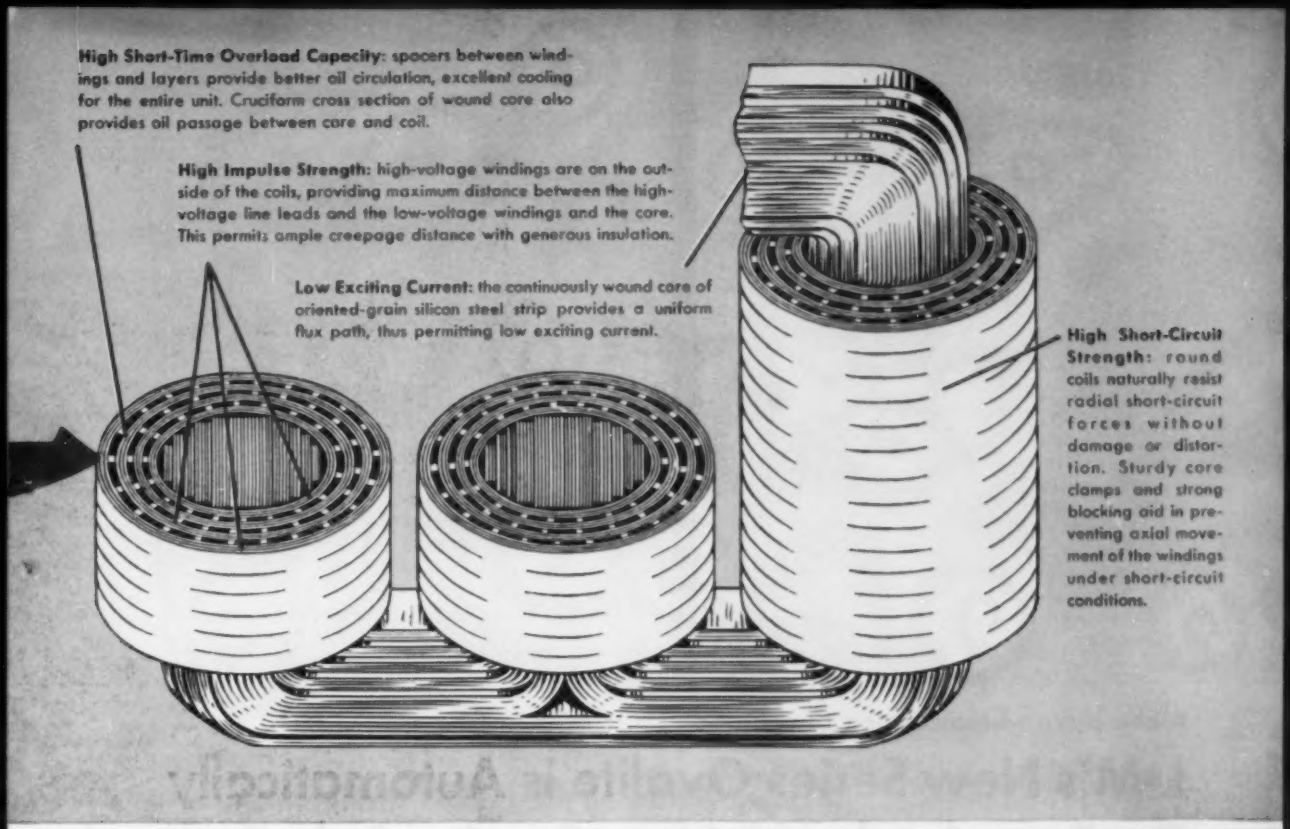


Core-coil assembly for a 500 kva Uni-Wound transformer. The sturdy core clamping frame and strong blocking contribute to high short-circuit strength.



Completed 500 kva Uni-Wound 3-phase transformer. The unit is smaller, shorter, and lighter than L-M's previous type. The transformer provides all the well-known advantages of L-M's single-phase Round-Wound transformers.

"Uni-Wound" and "Tri-Wound" are Line Material Company trade-marks.


High Short-Time Overload Capacity: spacers between windings and layers provide better oil circulation, excellent cooling for the entire unit. Cruciform cross section of wound core also provides oil passage between core and coil.
High Impulse Strength: high-voltage windings are on the outside of the coils, providing maximum distance between the high-voltage line leads and the low-voltage windings and the core. This permits ample creepage distance with generous insulation.
Low Exciting Current: the continuously wound core of oriented-grain silicon steel strip provides a uniform flux path, thus permitting low exciting current.
High Short-Circuit Strength: round coils naturally resist radial short-circuit forces without damage or distortion. Sturdy core clamps and strong blocking aid in preventing axial movement of the windings under short-circuit conditions.

Transformers in 112½ to 500 kva Sizes

Provides advantages of L-M Round-Wound® core construction in 3-phase transformers in sizes from 112½ through 500 kva. They're lighter, smaller, have improved overload capacity, high impulse level, high short-circuit strength.

By **ALVIN B. COYLE**
Manager,
Transformer Sales
Line Material Company

L-M Round-Wound construction consists of a continuously wound core, with round coils wound directly onto the core. This design has a number of advantages in improved performance and better mechanical strength.

Uni-Wound Fills Need

Now L-M engineers have developed a 3-phase transformer with all the advantages of Round-Wound construction. This is the new *Uni-Wound* transformer, which is now in production in sizes from 112½ through 500 kva, and in voltages through 13,800. In smaller 3-phase sizes L-M offers the new *Tri-Wound* transformer.

Continuously Wound Core

The Uni-Wound transformer consists of a unitary core, continuously wound of oriented-grain silicon steel strip. The bare core is annealed after winding. Then round coils are wound directly onto the three core legs by L-M's exclusive winding process.

All Other Round-Wound Advantages

Thus all of the inherent characteristics of the single-phase Round-Wound transformer are provided in the 3-phase Uni-Wound. These advantages include:

high short-time overload capacity
uniformly high impulse strength
high short-circuit strength
low exciting current
lighter weight • smaller size

Uni-Wound Lighter, Lower

The 500 kva Uni-Wound is about 1200 pounds lighter than the stacked lamination type. The 112½ kva, 2400 volt delta Uni-Wound is about 400 pounds lighter than the 112½ kva Triplex style. These lighter weights permit single-pole mounting of sizes through 150 kva instead of the 2-pole platform construction previously required. In some sizes, the over-all height has been reduced as much as two feet, with but little increase in projected floor space.

Balanced Performance

Both the physical and performance characteristics have been well balanced in the Uni-Wound 3-phase transformer design. Just as with the single-phase Round-Wound, no one characteristic has been emphasized at the expense of another. No one characteristic has been considered exclusively by itself, but only in its relationship to the over-all performance of the transformer.

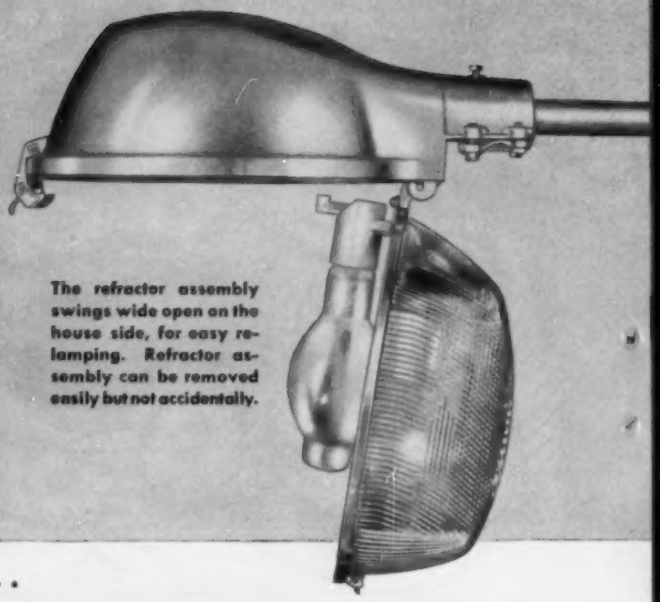
Get Details on Uni-Wound Transformers

Ask the L-M Field Engineer to give you full details; or write Line Material Company, Transformer Division, Zanesville, Ohio. (Line Material Company is a McGraw Electric Company Division.)

194

LM® LINE MATERIAL Transformers

The lamp and socket swing down as part of the glassware assembly, become automatically de-energized for quick, Service-Safe re-lamping during circuit operation.



The refractor assembly swings wide open on the house side, for easy re-lamping. Refractor assembly can be removed easily but not accidentally.

Make-before-break action of contacts . . .

L-M's New Series Ovalite is Automatically De-Energized with New Service-Safe Feature

Both lamp and socket are automatically de-energized and isolated from series circuit when glassware swings down. Make-before-break action of contacts in series luminaire eliminates arcing.

By **DEAN W. MORRILL**, Lighting Application Engineer, Line Material Company

L-M's new mercury vapor Ovalite offers outstanding design features for safe, economical servicing of the luminaire, in addition to its efficient light distribution.

The lamp and socket swing down as part of the glassware assembly; as the socket leaves the receptacle, it becomes automatically de-energized, and much more accessible for quick, safe re-lamping of the luminaire during circuit operation, saving service time.

Contacts on the series Ovalite are so designed that there is a make-before-break action, which means the lamp connections are shunted before they are disconnected. In restoring the connection the same principle applies. The lamp connection is made before the shunt is opened, eliminating arcing.

The contacts are silver-plated beryllium copper; socket is steatite; receptacle is wet-process glazed porcelain with a 5,000-volt insulation rating which meets EEI-NEMA specification of 19,000 volts withstand.

This new Ovalite provides a choice of horizontal or pendant mounting for mercury vapor; choice of types III or IV light-distribution patterns.

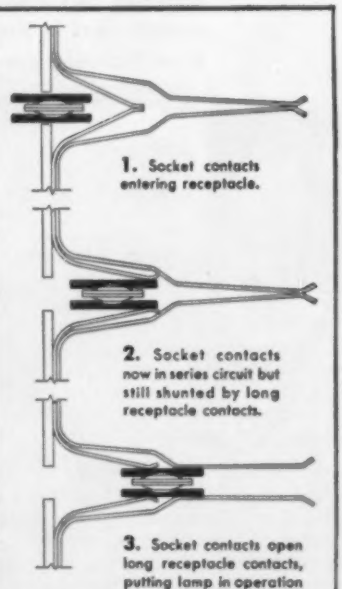
The Service-Safe feature of L-M's Ovalite is available in both multiple and series luminaires.

Get Complete Information

This series luminaire is specifically designed for the Uni-Ballast system. Ask the L-M Field Engineer or Lighting Engineer for information on the new L-M Ovalite; on Uni-Ballast, the most economical system for mercury vapor lighting; and on L-M's Lighting Recommendation Service. Or write Line Material Co., Milwaukee 1, Wis. (a McGraw Electric Company Division).

"Ovalite," "Uni-Ballast" and "Service-Safe" are Line Material Company trademarks.

211



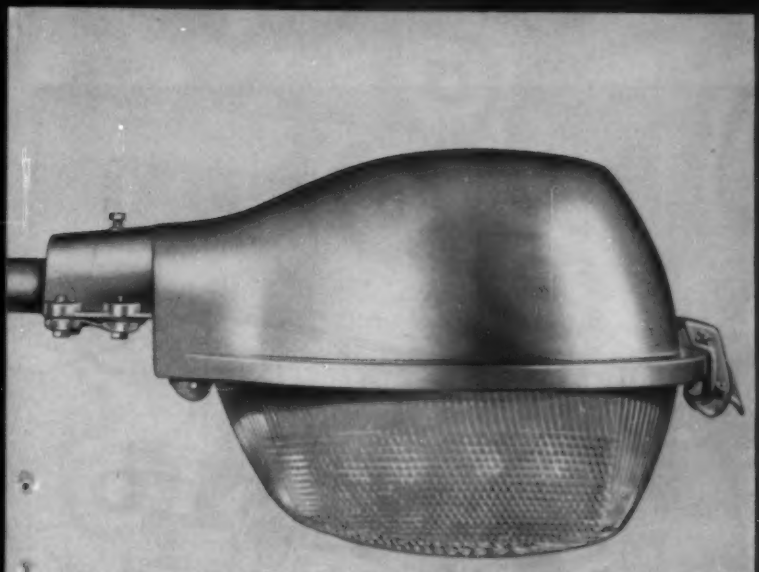
1. Socket contacts entering receptacle.

2. Socket contacts now in series circuit but still shunted by long receptacle contacts.

3. Socket contacts open long receptacle contacts, putting lamp in operation in series circuit.

NOTE—Procedure is reversed when socket is withdrawn during luminaire opening. Lamp is shunted before being withdrawn from circuit. This make-before-break action eliminates arcing.

LINE MATERIAL
Street Lighting



L-M's new mercury vapor Ovalite has high co-efficient of utilization on the street side, with a choice of types III or IV asymmetric light distribution merely by changing glassware.

Lamp and socket swing down, become automatically de-energized for quick, Service-Safe re-lamping during circuit operation.

Wiping-action contacts open circuit on multiple unit...

Now Quick Re-Lamping Possible with Ovalite's Automatic De-Energizing Feature

New Service-Safe design automatically isolates lamp and socket from circuit. As luminaire is closed, circuit is completed by means of wiping-action silver-plated beryllium copper contacts.

By **STACY STANDLEY**
Manager of Lighting Sales
Line Material Company

Here's a new feature in luminaire design that offers savings in servicing. L-M's Ovalite lamp and socket are automatically de-energized and isolated to provide quick, safe re-lamping of the luminaire during circuit operation.

The lamp and socket are part of the refractor assembly. On this multiple unit, wiping-action contacts open as the assembly is swung down, isolating the lamp and socket from the circuit and providing easy, safe access to the luminaire. The wiping action keeps the contacts clean.

The Service-Safe feature is also available on L-M's series Ovalite. This series Ovalite has a shunting make-before-break action.

Other Outstanding Features of L-M's Ovalite

Choice of type III or IV light-distribution pattern by simply changing the glassware.

High co-efficient of utilization on street side.

Latch automatically assures positive closing of luminaire when refractor is pushed up.

Both latch and hinge have a spring action to hold the refractor firmly against the gasket, assuring a bugproof, dustproof, and weatherproof seal.

Complete refractor assembly can be removed easily when desired, cannot be accidentally unhooked.

Hood is a smoothly finished one-piece aluminum casting.

One-piece aluminum reflector.

All hardware is stainless steel or non-ferrous metal.

No trapped light at the glassware junction.

Reflector and refractor are easily cleaned.

Get Complete Information

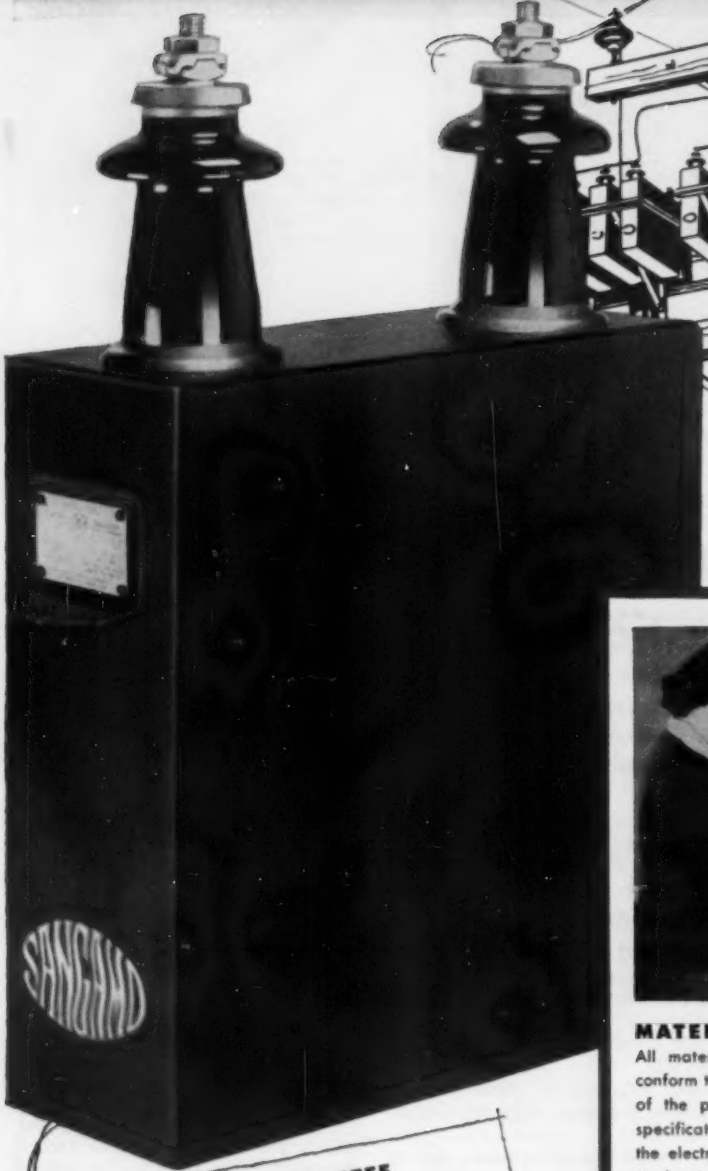
Ask the L-M Field Engineer or Lighting Engineer for information on the new L-M Ovalite, and on L-M's Lighting Recommendation Service. Or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division.)

"Ovalite" and "Service-Safe" are Line Material Company trademarks.

213

LINE MATERIAL *Street Lighting*

NOW...YOU CAN GET SANGAMO



NOW AVAILABLE IN THESE RATINGS:

2400 Volts.....25 KVAR
7200 Volts.....25 KVAR
Singlephase.....60 Cycles

MATERIALS AND PROCESS TESTING

All materials used in Sangamo Power Capacitors must conform to rigid specifications. Only paper dielectric made of the purest virgin pulp and meeting Sangamo's own specifications is ever accepted and the aluminum foil for the electrodes must be absolutely free of flaws and contaminants. Naturally, Sangamo Power Capacitors are subjected to frequent and exacting tests at each stage in their assembly.

GUARANTEE

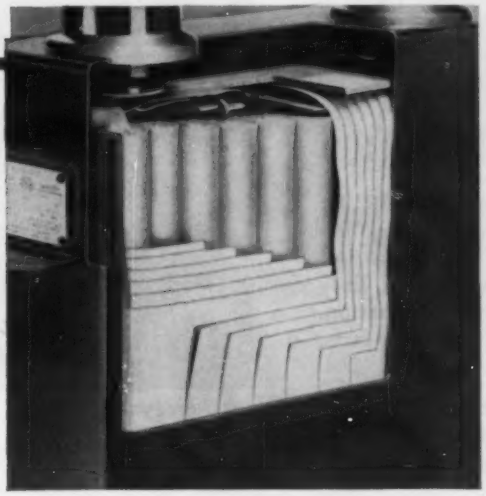
In this new venture Sangamo guarantees its customers—the utilities—the same excellent performance from this new product which its other products have given in the past.

SANGAMO

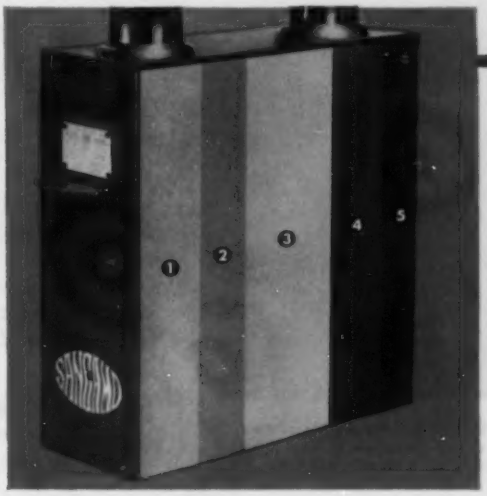
POWER CAPACITORS . . .

they're built for long life!

Power capacitors are only as stable in performance as the engineering, materials and processing techniques which go into their making. Each of these three basic factors is given minute attention in the manufacture of Sangamo Power Capacitors. Take the building where Sangamo Power Capacitors are produced. It's brand new, has the very latest in processing equipment, and is a "controlled conditions" plant. Controlled conditions mean that dust, for instance, is completely filtered out so there is little danger of contamination from this source. In this new plant, even the humidity can be regulated to assure product uniformity. But get the whole story. Write today for your copy of Bulletin 1120 or contact the Sangamo representative in your area.



PROTECTED INSIDE . . . Case and both terminals are completely filled with Sangamo *Diaclor*, a high-strength, low loss, liquid dielectric, which enables safe operation in ambient temperatures as low as minus 40°C. Multi-layered Kraft insulating paper folded completely around the internal pack assembly provides solid insulation to case at all points.



PROTECTED OUTSIDE . . . To obtain the finish which gives enduring protection against corrosion and abrasion, five steps are required. First, the case is tin-plated inside and out. After impregnating and sealing, the capacitor is sand-blasted, preparatory for aluminizing. Then several coats of molten aluminum are sprayed on the case. Fourth, a primer coat of paint is applied. The final step, the finish coat, consists of a highly weather-resistant paint.

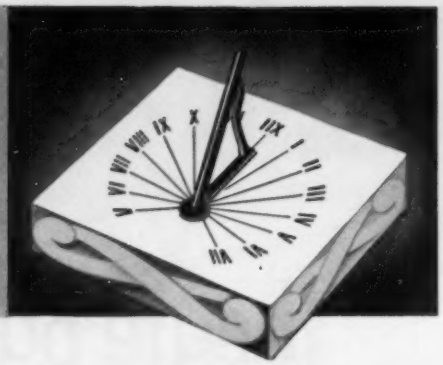
SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

FCSS-1

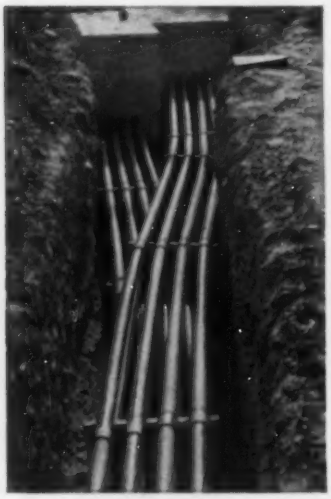
QUALITY

...proved by TIME...



Of course the most convincing proof of Orangeburg's enduring quality is its 62-year record of service to leading Public Utilities, Municipalities and Contractors.

Quality stands out in every feature. Orangeburg Fibre Conduit is lightweight yet strong, tough and resilient. Its impermeable walls and tight joints keep out corrosive ground waters. Its smooth bore and low coefficient of friction protect cable sheaths from abrasion. Orangeburg material resists acids, alkalies, salt, grease and oil.



ORANGEBURG STANDARD is installed with concrete encasement. Preferred for banks of three or more ducts.

For these and other advantages Orangeburg provides complete security for electrical services underground. Result...no interruption of power. These vital services keep flowing.

SAVES MONEY, TOO!

Saves by prolonging cable life . . . by faster and easier handling, tooling and laying . . . and by the use of Orangeburg's standard fittings. They cut costs by simplifying installation. Send to Dept. EW-35 for more facts.

ORANGEBURG MANUFACTURING CO., INC.
Orangeburg, New York
West Coast Plant — Newark, California

ORANGEBURG NOCRETE is installed without concrete encasement. Extra heavy wall for direct burial.

ORANGEBURG FIBRE CONDUIT

STANDARD INSTALLED WITH CONCRETE

NOCRETE INSTALLED WITHOUT CONCRETE

GraybaR ELECTRIC COMPANY

DISTRIBUTORS, ORANGEBURG FIBRE CONDUIT

BRANCHES AND STOCKS IN PRINCIPAL CITIES

GENERAL ELECTRIC SUPPLY COMPANY

A DIVISION OF GENERAL ELECTRIC DISTRIBUTING CORPORATION

Permanently grounded for complete protection

Just as important as the equipment that goes into a new utility or sub station is the protection of that equipment. Grounding of every unit is an important part of that protection. For the best GROUNDING system possible, specify CADWELD electrical connections. They are permanent, cannot loosen or corrode and have a greater current carrying capacity than the conductor itself.

CADWELD®

Erico Products, Inc.

2070 E. 61st Place • Cleveland 3, Ohio

IN CANADA: ERICO INCORPORATED, 3571 Dundas St., West, Toronto 9, Ontario

POWER UTILITY STEPS UP USEFUL AIR-TIME ONE-THIRD

Albany district of Niagara-Mohawk Power Corporation is using General Electric all-electronic selective calling equipment to gain one-third more useful air-time in its 2-Way Radio system, according to Wesley Baylis, Niagara-Mohawk Communication engineer.

THIS selective calling system permits the radio dispatcher to **(1)** call an individual driver in the normal manner, **(2)** automatically call him to the radio by audible means when he is working away from his vehicle, or **(3)** leave a call for him when he is out of audible range, by means of a signal light on the radio control unit, which remains lighted until he answers.

The dispatcher saves valuable air-time because he need not keep repeating a call for a driver who is away from his vehicle. He completes more calls faster. The saving of air-time, permitted by General Electric selective calling, also allows optimum use of 2-way radio on more vehicles than is normally possible.

Private conversations are carried on by Niagara-Mohawk between 12 dispatching points and any of 60 electric and gas service vehicles operating within a 60-mile radius of Albany, New York. Selective calling also eliminates most interfering calls from other utility radio systems, no matter how powerful their signals may become during freak atmospheric conditions.

* * *

FOR ADDITIONAL INFORMATION on G-E *all-electronic* selective calling equipment, write: *General Electric Co., Section X1935-7, Communication Equipment, Electronics Park, Syracuse, N. Y.*

1. ALWAYS AVAILABLE BY RADIO...even with an air hammer going. The foreman of this gas service crew of Niagara-Mohawk can be called to the radio in his truck at any time. General Electric selective calling permits the master control dispatcher to automatically sound the vehicle's horn, which can be heard over the din of excavation work and traffic.

2-WAY MOBILE RADIO

FREQUENCY STABILITY & SELECTIVITY *guaranteed for life!*

2. MASTER CONTROL for Albany District of Niagara-Mohawk. Two dispatchers are used to coordinate radio calls to 60 vehicles of both gas and electric service departments. Calls from eleven remote control points are relayed through master controllers and one 50-watt G-E transmitter. Master controllers can contact any individual vehicle at any time through a General Electric selective calling system.

3. REMOTE CONTROL point in radio system of Niagara-Mohawk Albany District, which funnels calls through a master control and 50-watt transmitter to any individual gas or electric service vehicle.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Supplementary pages for the BTC Hi-Line Hardware Catalog have just come off the press. These supplements contain blueprints and complete specifications on revisions and additions to our line of Drop-Forged Steel and Aluminum Hi-Line Hardware.

Send for these free supplementary pages and bring your BTC Catalog up-to-date. If you do not already have a catalog, indicate on coupon and a complete, revised copy will be mailed to you without charge.

THE BREWER-TITCHENER CORPORATION
CORTLAND, N.Y.

Pioneers in Drop-Forged Hi-Line Hardware

Clip & Mail Today!

THE BREWER-TITCHENER CORPORATION
CORTLAND, N.Y.

☐ Please send Supplementary Pages for BTC Catalog.
☐ Send complete, revised BTC Hi-Line Hardware Catalog.

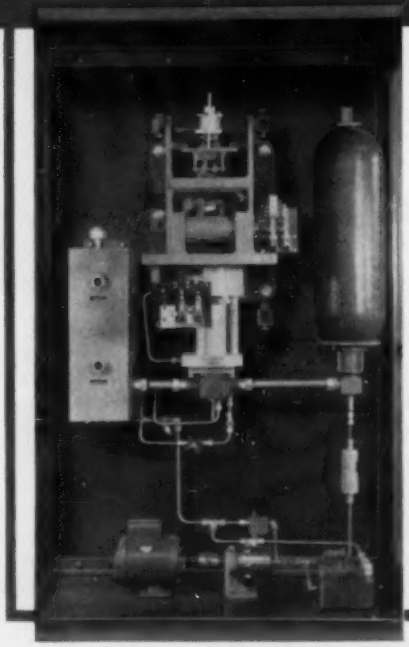
NAME _____ TITLE _____

COMPANY _____

STREET _____

CITY _____ STATE _____

Pneu-Draulic already in use on

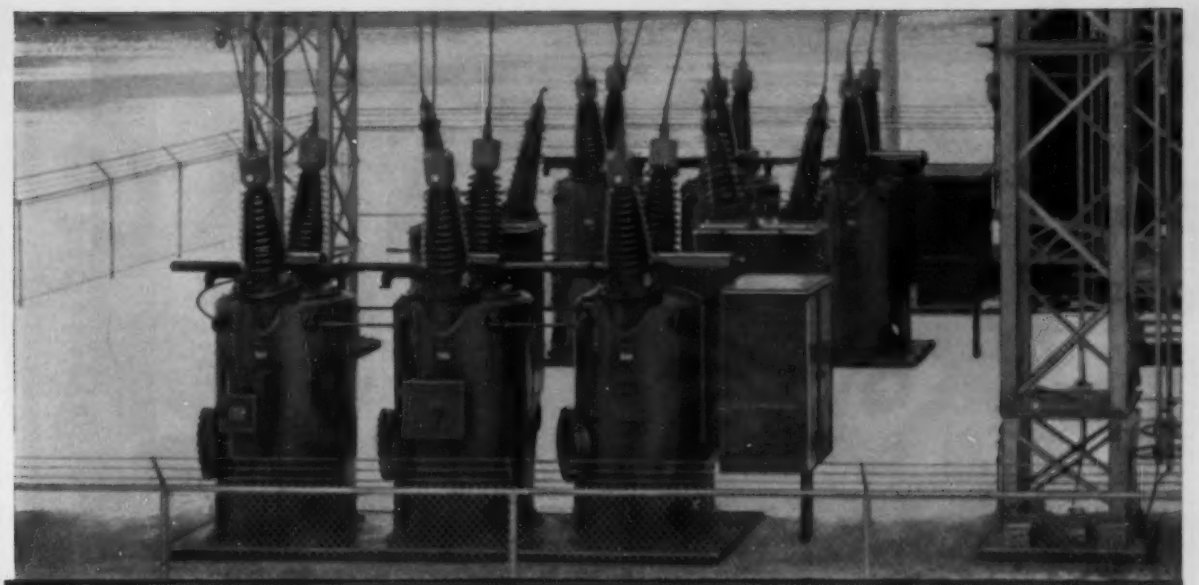


Here's the story of the remarkable acceptance of this new principle of operation. Not only are 15 systems now using breakers with *Pneu-Draulic* operators, but within six months this figure will be doubled.

Acceptance is based on the fact that the *Pneu-Draulic* operator looks simple . . . and is simple. It eliminates the mechanical problems inherent in previous designs. Call your nearby A-C office for information, or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-4568

Pneu-Draulic is an Allis-Chalmers trademark.

ALLIS-



Operators 15 power systems

Check these 7 reasons why you too should insist on breakers with Pneu-Draulic operators

1 Simple — Has fewer parts than other types of operating mechanisms.

2 Unaffected by Temperature — Whether it's hot or cold, the energy stored in the system provides more than standard number of operations. Use of oil with constant viscosity over wide range of temperatures insures uniform performance.

3 Eliminates Moisture and Corrosion Problems — Entire system is filled with oil containing inhibitor which eliminates rust, freezing and corrosion.

4 No Dust Problem — Offers protection of a sealed system. Efficient filtering eliminates dust and dirt problems.

5 Fast — Actually could be set to operate at speeds far faster than present useful speeds.

6 Emergency Closing — Can be closed at full speed onto energized line even when no control power is available.

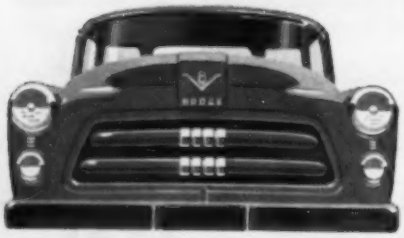
7 Mechanically Trip-Free—Simple mechanically trip-free mechanism, proven on other Allis-Chalmers high speed breakers, has been adapted to the *Pneu-Draulic* operator.

CHALMERS

A-C ALLIS-CHALMERS

Less heat waste here
More heat utilized here
Dodge V-8
Less surface area, less heat lost
Rounded exclusive Power-Dome combustion chamber has less surface area than irregular chambers. Thus less heat is dissipated into cooling system, more heat is utilized within the chamber to expand gases more fully, give greater thrust to piston.
Dodge avoids power-stealing hot spots
Ordinary ignition
Pre-ignition from carbon "hot spots"
Power-Dome combustion chambers are rounded, have no corners or pockets in which carbon deposits can build up. Such deposits become red-hot, pre-ignite the fuel-air mixture, cause engine knock and loss of power, lead to costly repairs.
Short flame travel, better valving
Dodge V-8
Ordinary V-8
With Power-Dome combustion chambers, the spark plugs are located at or near the center. Thus the flame has a shorter distance to travel, combustion is more even. Large unrestricted valves mean better "breathing" and greater efficiency.

How you get more power, use less gas with POWER-DOME V-8 truck engines!



Truck owners everywhere report more power and less fuel consumption with new Dodge Truck Power-Dome V-8 engines. AAA-supervised tests *proved* the power of Dodge Truck V-8's in a history-making Pikes Peak climb . . . proved the economy of Dodge Truck V-8's in a sensational 22-mile-per-gallon Economy Run.

Look at the pictures and captions shown on this page—then, for further details and an eye-opening road test, see your dependable Dodge Truck dealer!

DODGE "Job-Rated" TRUCKS

A PRODUCT OF CHRYSLER CORPORATION

ALL THE FEATURES *plus* ....

MATCHED ENCLOSURES!

SQUARE D's
NEW
POWER-STYLE
SWITCH BOARDS

DESIGN LEADERSHIP FEATURES

Distinctive Styling provides an attractive, modern appearance matching the control center design.

Easier Installation because removable front and back plates expose generous wiring parts. Isolated horizontal wiring trough has drop-off openings, assuring safer, neater wiring.

Flexibility. Complete sections or branch units can be added or changed to meet specific job requirements.

Easier Inspection and Maintenance. Front, side and back plates are removable, thus providing easy and immediate access to specific areas.

SEPARATELY .... OR AS A TEAM THEY DO THE JOB BETTER!

Write for Bulletin SD-12. Address Square D Company, 6060 Rivard Street, Detroit 11, Michigan.

Write for Bulletin 244. Address Square D Company, 4041 N. Richards St., Milwaukee 12, Wisconsin.

SQUARE D's **NEW**
PLUG-IN
CONTROL CENTERS

DESIGN LEADERSHIP FEATURES

Increased Safety because bus bars are fully enclosed, rigidly supported and have ample cross section...circuits isolated by individually enclosed plug-in units...disconnect handle designed for maximum operator protection.

Flexibility. Individual plug-in units or complete sections can easily be added, removed or exchanged. Push-buttons, pilot lights, and selector switches can readily be added to unit doors.

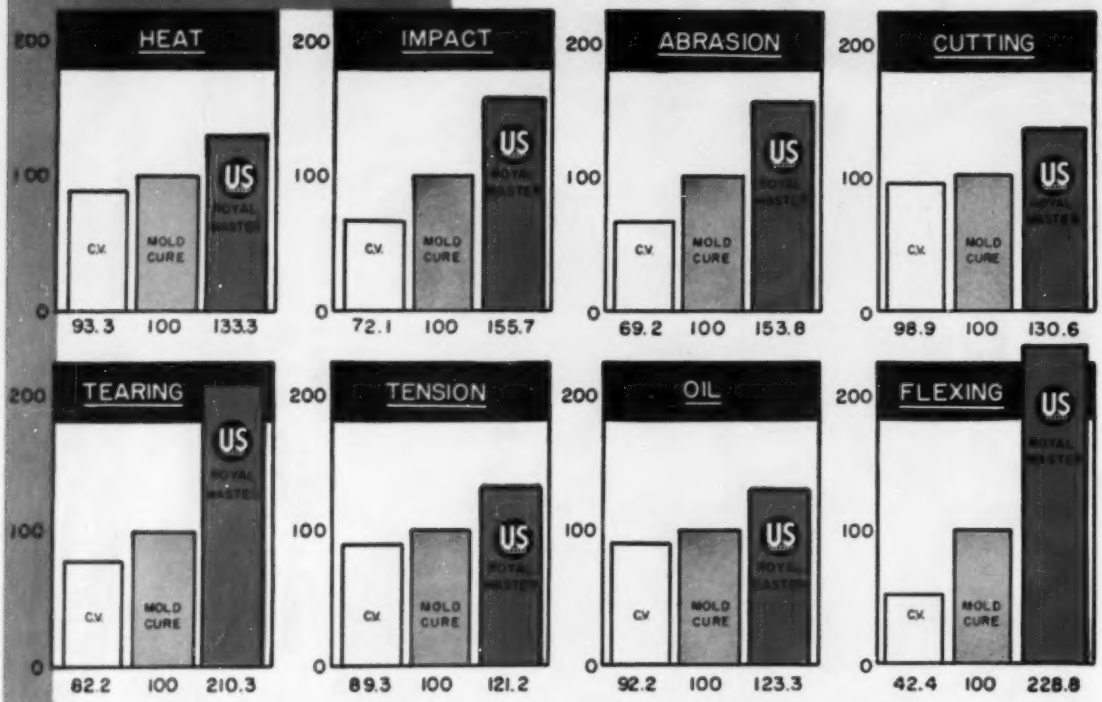
Installation Economy. All wiring channels are large and accessible from front without removing units...no "wire fishing."

Space economy, too. Up to six combination starters fit in a 20"x20"x 90" section. Plug-in unit heights are designed in space-saving increments of 3 inches.

SQUARE D COMPANY

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

New U.S. ROYAL outperforms,



Comparative performance of portable cords related to major life factors.

Graphs illustrate the outstanding superiority of new U. S. Royal Master Cord—over the average of molded cords and the average of short-lived continuous vulcanized cords of other makes—on every major life factor. (Average of other molded cords is rated at 100%.)

US RUBBER

UNITED STATES

ELECTRICAL WIRE AND CABLE DEPARTMENT

MASTER portable cord *outlasts all others!*

Comparative tests show U. S. Royal Master gives $1.88 in value for every $1.00 spent — almost *twice* the service value of the average of other molded cords!

LOOK FOR THE NAME — U. S. ROYAL MASTER

Two years ago, "U. S." engineers began a *complete reexamination* of portable cord construction, service life, and the causes of cord failure.

Over 10,000 tests were made. More than a thousand cords of all leading makes, including our own famous U. S. Royal Cord, were analyzed, tested, and compared.

Every life factor was considered and carefully evaluated, alone and in its relation to overall cord performance and service life.

Backed by 64 years of experience in the manufacture of electrical wire and cable, U. S. Rubber engineers then translated their findings into an entirely new portable cord, designed to surpass any other previously made.

Extensive tests, both in the laboratory and in outside plant installations have proved this new portable cord startlingly superior in every respect!

New U. S. Royal Master is unquestionably the finest cord you can buy!

From every standpoint, as the charts at left illustrate, new U. S. Royal Master is a finer, more durable cord—actually gives 88% longer life than the average of competitive molded cords—far longer than *any* other cord—surpassing even a hypothetical cord incorporating the best features of all those tested!

Far greater value, too! In spite of almost doubled service life, this great new cord is in the same price category as other molded cords—giving you $1.88 in cord value for every cord $1.00!

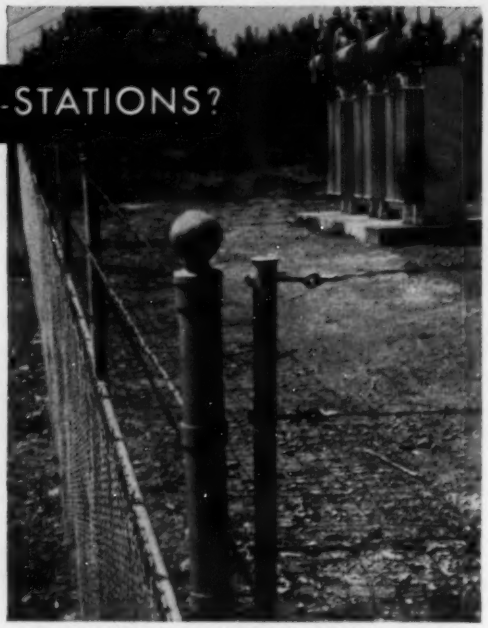
Prove to yourself the outstanding superiority of new U. S. Royal Master Portable Cord—in both service life *and* economy! Write address below for FREE descriptive booklet illustrating the superiority of the U. S. Royal Master Cord. And get in touch with your "U. S." distributor today.

Approved by Underwriters' Laboratories, Inc.

RUBBER COMPANY

ROCKEFELLER CENTER, NEW YORK 20, N. Y.

WEEDS AROUND SUB-STATIONS?



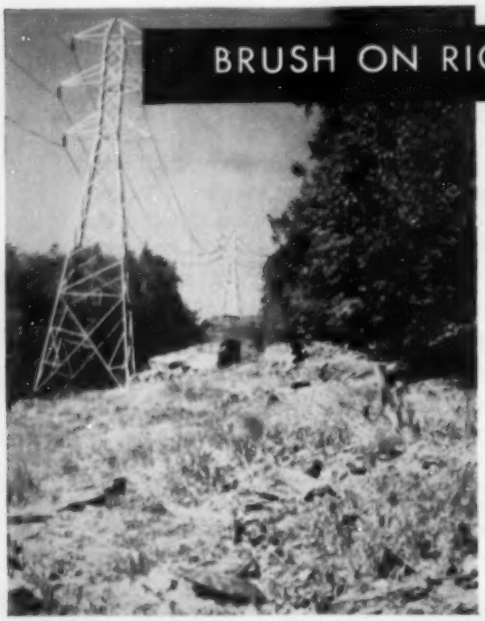
"Telvar" is ideal for weed control around fences, poles, towers. It's low in toxicity to humans and animals, non-volatile, non-flammable and non-corrosive to equipment.

One application of **Du Pont Telvar**®
WEED KILLERS

stops weeds for the season—or longer!

"Telvar" kills weeds through the roots . . . prevents regrowth. Low rates (20 to 80 lbs. per acre) make it cost little for the results you obtain . . . also mean less handling, fewer storage problems. To cut maintenance costs to new low levels, put "Telvar" in your weed-control program. Available in two formulations: "Telvar" W, and "Telvar" DW.

BRUSH ON RIGHT-OF-WAY?



"Ammate" applied five years ago, is still keeping brush down along this right-of-way. "Ammate" allows low-growing cover to return to resist erosion.

One application of **Du Pont Ammate**®
WEED AND BRUSH KILLER

kills more kinds of brush —safely—at lower cost!

"Ammate" kills more kinds of brush and keeps it down longer than most weed and brush killers! When the original spray job is done well, brush is kept under control for years with only an occasional spot spray. You can rely on "Ammate" to do the job safely, even where your right-of-way adjoins cropland, because "Ammate" is not volatile. There are no vapors to drift onto sensitive crops. It is no hazard to crews, stock or wildlife.

FREE ILLUSTRATED BOOKLETS describe how to control weeds and brush with Du Pont chemicals. For your copies, write to Du Pont, Grasselli Chemicals Dept., Rm. D-4032, Wilmington 98, Del. In Canada, Du Pont Company of Canada Limited, Box 660, Montreal.

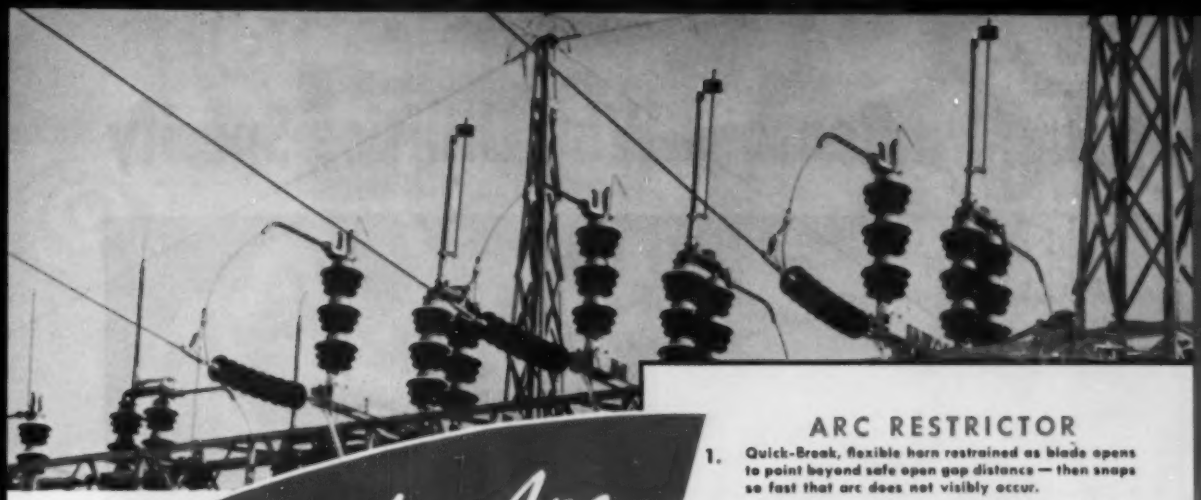
On all chemicals always follow directions for application. Where warning or caution statements on use of the product are given, read them carefully.

Telvar® Weed Killers for industrial use

DU PONT
REG. U.S. PAT. OFF.

Ammate® Weed and Brush Killer

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY



Snap the Arc—

ARC RESTRICTOR

1. Quick-Break, flexible horn restrained as blade opens to point beyond safe open gap distance — then snaps so fast that arc does not visibly occur.
2. Will successfully interrupt line-charging and transformer magnetizing current up to 15 amps.
3. Available for any standard switch — vertical or side break — already existing or on new R&IE switches.

SWITCH LINE CHARGING and/or TRANSFORMER MAGNETIZING CURRENTS Easily, Safely with the

R&IE SWITCH ATTACHMENTS

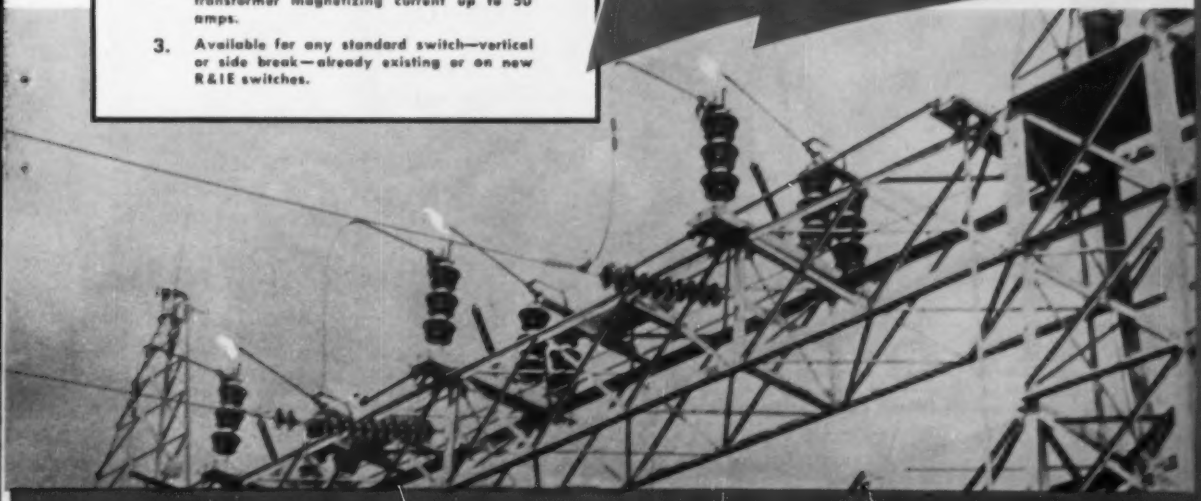
Write for Technical Paper 1346 F, or ask about our motion picture test record

R&IE EQUIPMENT DIVISION
I-T-E CIRCUIT BREAKER COMPANY
GREENSBURG, PA.

GAS BLAST

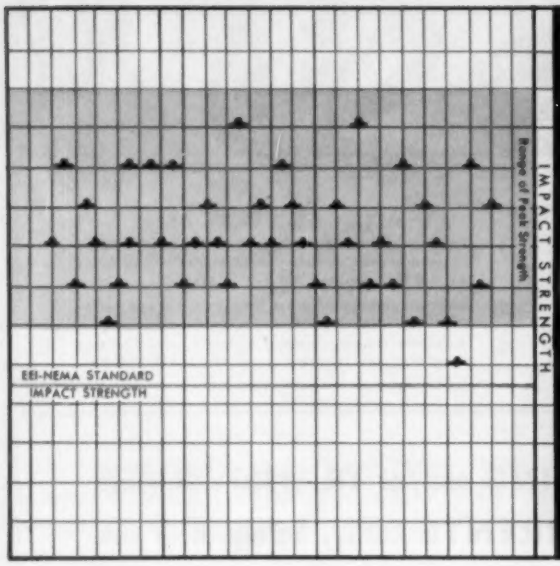
1. Blast tube directs jet of nitrogen or compressed air at points where switch horns part. Blast cools and destroys forming arcs.
2. Will successfully interrupt line-charging and transformer magnetizing current up to 50 amps.
3. Available for any standard switch—vertical or side break—already existing or on new R&IE switches.

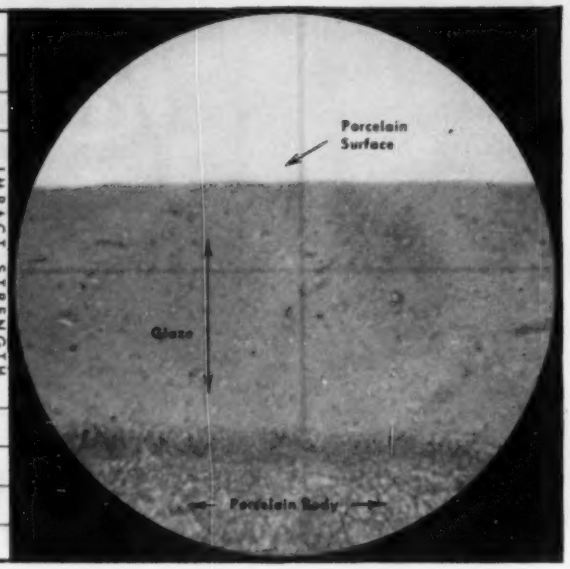
or Blast it!



INDOOR BUS SUPPORTS and BUS FABRICATION • OUTDOOR BUS SUPPORTS and AIR SWITCHES • SUBSTATION STRUCTURES—steel or aluminum • TESTING DEVICES • KIRK KEY INTERLOCK SYSTEMS • ISOLATED PHASE BUS STRUCTURES • INTERRUPTER SWITCHES

6 Reasons Why Utilities Specify



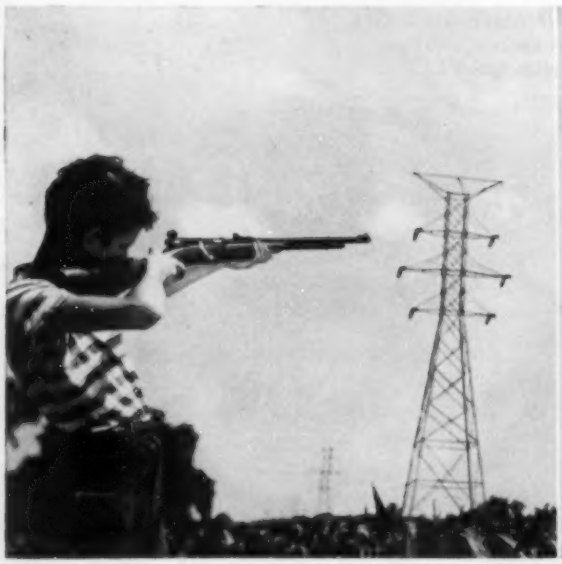


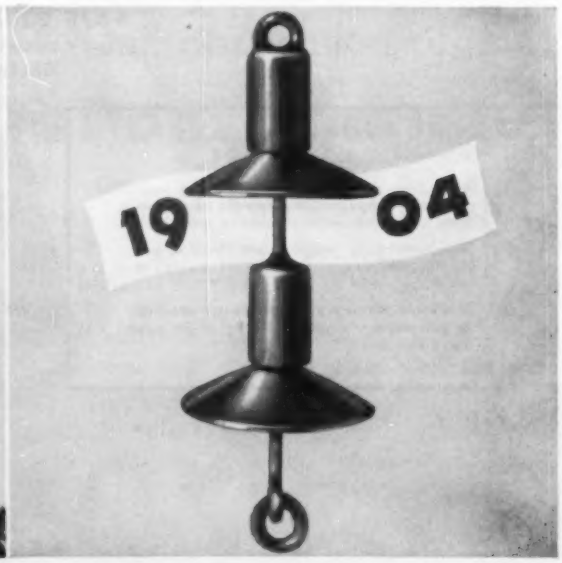
1. No Weak Sisters

AIEE standard tests show 98% of 10" MICRO-GLAZE* insulators tested fall within range of "peak impact strength." Representative industry samples tested were below this range.

2. Micro-control of Glaze Thickness

By precisely controlling glaze thickness (shown in photomicrograph of insulator surface section), Locke develops peak porcelain strength in production of suspension insulators.





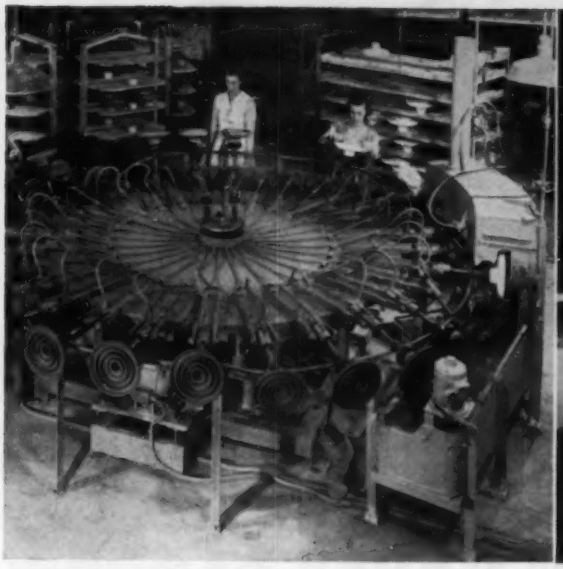
5. Less Chance of Damage

By installing Locke Microglaze* Suspension Insulators, utilities invest in extra protection against damage in transport and installation, as well as against malicious damage of transmission lines.

6. Half Century of Service

Since 1904 Locke suspension insulators have served dependably on power lines throughout the world. Half a century of outstanding product development stands behind Locke Microglaze* Suspension Insulators.

Locke MICROGLAZE Suspension Insulators



3. Precision Glazing

As insulators spin their way around this machine, they are cleaned, moistened, glazed exactly alike. With other controls, this assures uniform appearance, top strength, uniform reliability.

4. Highest Impact Resistance

Standard Impact Tests were pioneered by Locke. Hammer blows of increasing severity prove the standard impact rating is an understatement of the true strength of MICROGLAZE* suspension insulators.

Do as more utilities are doing every day--specify LOCKE Microglaze* Suspension Insulators

LOCKE

LOCKE DEPARTMENT
GENERAL ELECTRIC COMPANY
BALTIMORE, MARYLAND

*Trademark of General Electric Company

Line construction bodies for light to heavy-duty. Crew compartments optional. Efficient tool compartments and drawers.

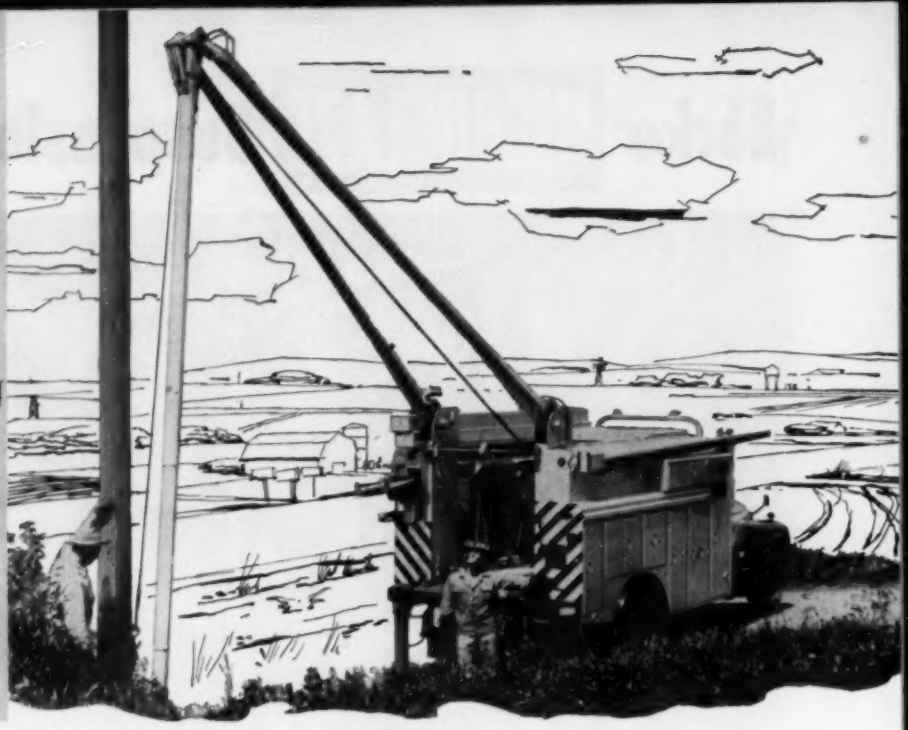
Bodies for truck driven air compressors. Designed to accommodate hose reels, tapping machines, jack hammers, etc.

Service bodies for chassis up to 1½ ton. Lengths, 75", 84", 90" and 102".

Tree trimmer body accommodates 7-man crew. Aerial and winch equipment optional. Side rack hinges for easy unloading of brush.

Light-duty power operated derricks for front or rear mounting. Operating range of 146°.

Holan 3700 Heavy-Duty Live-Boom Power Derrick is illustrated with stiff-leg integral removing pole from ground. Rated safe-load capacity of 12,000 pounds exceeds all previous derricks of its type; loads body under power with maximum 5,000 pounds. For big lifts, Holan Self-stowing Hydraulic Jacks are recommended.



GREATEST "LIFT" MONEY CAN BUY!

Ladders to 40' with all phases completely hydraulic. Pump actuated by P.T.O. or separate engine drive with electric starter.

Mechanical Ladders expertly engineered and counterbalanced for effortless handling. Maximum heights from 23' to 40'. Swings 360°; angles to 72°.

Portable mechanical and hydraulic earth borers with optional rotation.

Wide variety of pole and reel trailers. Standard and special. Many optional features.

Hydraulic jacks, controlled from rear of truck. Rigid mounted or patented Holan self-stowing types.

Hydraulic towers with rotary, stationary, or transverse platforms. Exclusive box-girder telescoping mast.

Holan-engineered to hoist loads never before achieved by a live boom power derrick, this mighty hydraulic weight-lifter handles burdens up to 6 tons! Powerful double-acting cylinders offer plenty of brawn to tote 70-foot poles and "H" frames.

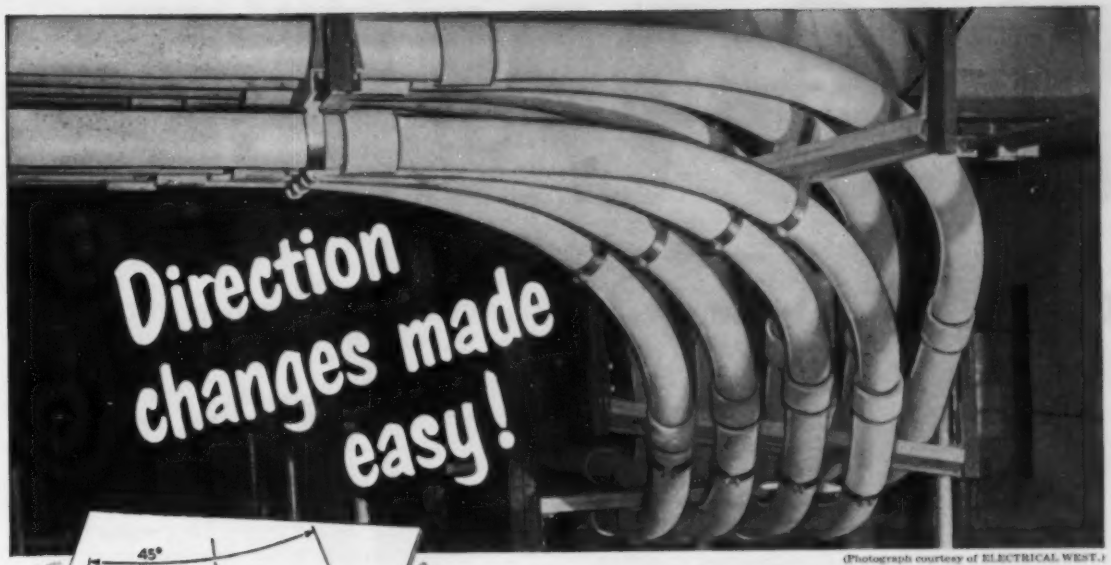
A working range of 195°, from over-the-cab storage to a five-foot head height for easy winch line threading, combines versatility with strength. Power body-loading capacity of 5000 pounds is also an important feature. Super-sensitive throttle controls at rear of truck put you in complete command of speed and position of the derrick at all times . . . easy as handling a toy train! Protection of crew and equipment is assured by numerous safety-engineered features.

If pole setting and other weighty jobs are over-taxing your crew and equipment, you'll want to see this heavyweight in action building efficiency and morale, and reducing costs. Yes, a Holan Series 3700 Heavy-Duty Power Derrick will soon earn its own way on your team. Write for more details.

"You"-tility Engineered by J. H. HOLAN CORPORATION

4100 WEST 150 ST. • CLEVELAND 11, OHIO

THE NAME THAT MEANS WORK SIMPLIFICATION



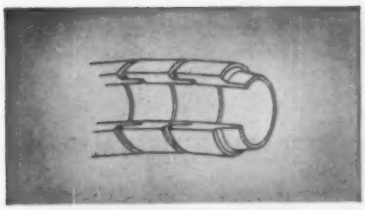
(Photograph courtesy of ELECTRICAL WEST.)

. . . with standard fittings for TRANSITE asbestos-cement DUCTS

When you use Transite Ducts, you have available a wide variety of standard fittings, made of the same asbestos-cement material as the ducts themselves. These fittings save time and expense because they provide maximum flexibility in laying out or constructing a duct system. They facilitate clearing unexpected obstructions or accommodating revisions in the original layout.

For instance, the new Transite 5° Bend Segments (shown at left) can be used alone to form simple and complex curvatures of any multiple of 5°. Used with other standard Transite curved fittings, they form curvatures of odd degrees. Thus, they enable you to simplify cross-overs and transformations . . . to clear obstructions . . . to form unusual or special bend or offset sections. They eliminate the need for purchasing special radii bends or sweeps. The other standard Transite fittings that facilitate directional changes are the offset bends, standard 45° and 90° bends, sweeps, curved segments, laterals, tees, elbows and deflection couplings.

For complete information write for new brochure EL-45-A, "Fittings and Dimensions of Transite Ducts." Contains all dimensional data required by the designer. Also available, "Transite Duct Underground Installation Sheet," EL-43-A. Johns-Manville, Box 60, New York 16, N. Y. In Canada, 199 Bay St., Toronto, Ontario.



5° bend segment sketched in detail. It consists of a straight section of Transite stock with a male taper on one end and a female taper on the other . . . each machined at an angle of 2½° to the center axis. Segments can thus be used single, or combined to form bend sections whose curvature is any multiple of 5°.

Photograph showing use of bend segments and curved segments with Transite Ducts.

5 OTHER REASONS WHY TRANSITE DUCTS DO A BETTER JOB AT LESS COST:

1. **Corrosion-Resistant.** Transite, being made of inorganic asbestos and cement, resists corrosion and is immune to electrolysis.
2. **Permanently Smooth Bore.** Transite makes long cable pulls easy, under any conditions. Danger of damage to cables is also minimized.
3. **Incombustible.** Transite will not burn or contribute to formation of smoke, gases, fumes. It confines burnouts, will not soften under heat.
4. **Higher Thermal Conductivity.** Cables run cooler in Transite, reducing I^2R losses, increasing current capacity and prolonging insulation life.
5. **Easy to Install.** Transite Ducts are light weight, easy to handle. Joints are quickly made. Long 10-foot lengths reduce number of joints in line.

Johns-Manville TRANSITE® DUCTS

JM PRODUCTS

TRANSITE KORDUCT—for installation in concrete

TRANSITE CONDUIT—for exposed work and installation underground without a concrete encasement

ELECTRIC POWER

DELCO-REMY ThunderVolt A.C. GENERATORS FOR EXTRA-HEAVY ELECTRICAL LOADS

Delco-Remy's new ThunderVolt-12 A.C.-D.C. charging systems are the answer to the *extra-heavy* electrical demands of late-model utility trucks, police prowl cars, and other vehicles equipped with two-way radio, floodlights, or other special electrical units. High wattage output is ample for heaviest electrical loads . . . generators pick up discharged batteries quickly in emergencies. Delco-Remy A.C.-D.C. charging systems are unexcelled at curb-idle . . . furnish up to 180 amperes at higher engine speeds . . . are dependable under the most rugged operating conditions at all engine speeds.

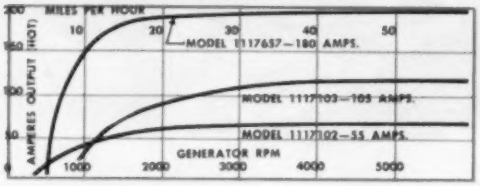
ThunderVolt 6 and 12 application packages, complete with installation instruction sheets for popular makes of cars and trucks, are available. Conversion is simple. See your nearest United Motors distributor for additional information.

A.C. GENERATOR PERFORMANCE DATA

Model	Volts	Cut-In RPM*	Curb Idle Amperes*	Maximum Amperes	Power Watts	Recommended For
1117102	12	600	30-40	55	660	All speeds.
1117103	12	975	6	105	1260	All speeds.
1117657	12	625	100	180	2160	All speeds.
117062-3-4	6	750	30-40	90	540	All speeds.

*APPROXIMATE (BASED ON 100 GENERATOR RPM/MPH)

A.C. GENERATOR OUTPUT CURVES



DELCO-REMY ThunderVolt D.C. GENERATORS FOR MEDIUM-TO-HEAVY ELECTRICAL LOADS

Delco-Remy's ThunderVolt-12 extra-output D.C. generator is an economical answer to the electrical needs of late-model utility trucks, suburban police cars, rural mail cars . . . other vehicles with additional lights, two-way radios, or other special electrical equipment in medium- to heavy-duty service. Delco-Remy extra-output D.C. generators are low in cost, simple to install, economical to maintain. Performance data on the ThunderVolt-12 D.C. generator is shown at the right.

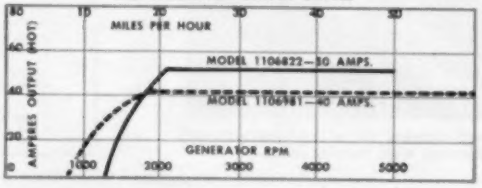
For further details and application data, see your nearest United Motors distributor.

D.C. GENERATOR PERFORMANCE DATA

Model	Volts	Cut-In RPM*	Curb Idle Amperes*	Maximum Amperes	Power Watts	Recommended For
1106822	12	1300	0	30	600	Medium to high speeds.
1106981	12	800	15	40	480	Low speeds & idling.
1106757	6	830	13	55	330	Medium to high speeds.
1106758	6	600	25	45	270	Medium to high speeds.
1108977	6	600	28	55	330	Low speeds & idling.

*APPROXIMATE (BASED ON 100 GENERATOR RPM/MPH)

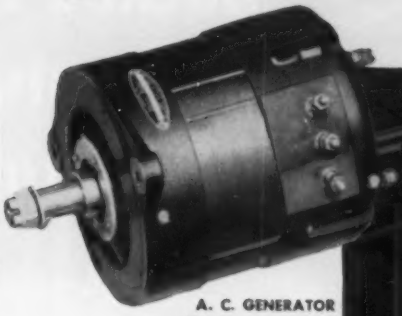
D.C. GENERATOR OUTPUT CURVES



Delco-Remy
ThunderVolt
ELECTRICAL SYSTEMS

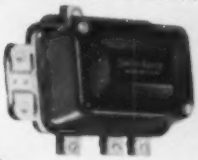
DELCO-REMY • DIVISION OF GENERAL MOTORS • ANDERSON, INDIANA

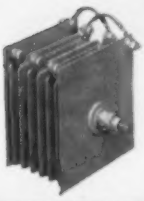
right for the job



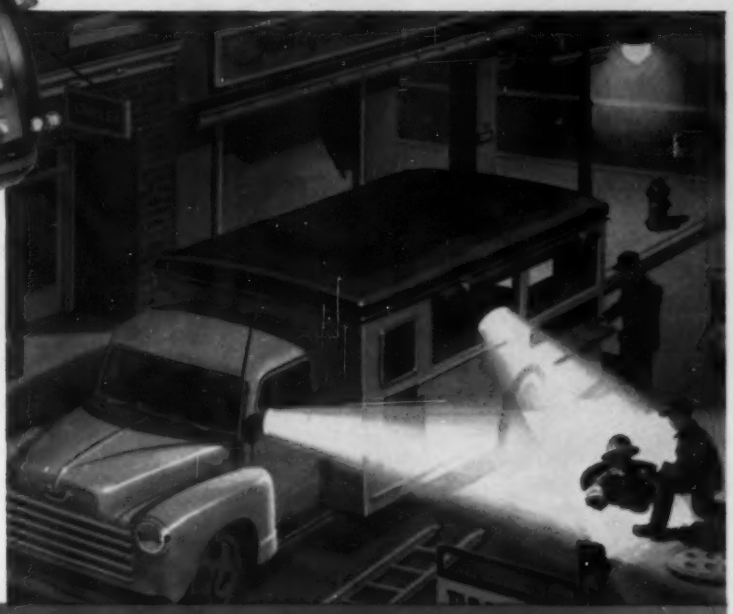
A. C. GENERATOR

REGULATOR

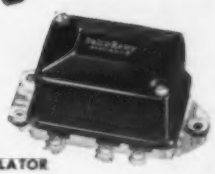




RECTIFIER



D. C. GENERATOR



REGULATOR

COPYRIGHT 1955—DELCO-REMY DIVISION, GENERAL MOTORS CORP.

A GENERAL MOTORS PRODUCT GM A UNITED MOTORS LINE

FIFTY YEARS OF backed by guarantee from

AMCRECO
LOWRY PROCESS
CREOSOTED WOOD
Since 1904

First Half Century of Modern Wood Preservation made possible by invention of the Lowry Process

A little over fifty years ago in a plant at Shirley, Indiana, Mr. C. B. Lowry introduced his Empty Cell Creosoting Process to the world—an event that opened the door to the modern era of wood preservation and marked the beginning of success in man's age-old struggle to find a low cost wood preservative.

The Lowry Empty Cell Process opened the door to the modern era by making it possible to impregnate wood successfully with far less creosote and in far less time than was possible with the leading wood treatment process up to that time. The Lowry Process cut the cost of creosoting approximately in half and made it economical for the expanding railroad industry and other users of construction woods to take advantage of this service.

Lowry conceived the idea for his process about 1902, demonstrated it in an experimental plant for the Big Four Railroad at Riverside, Ohio in 1903, used it in commercial operations for the Big Four at the Shirley plant in 1904 and applied for a patent in 1905. The subsequent granting of patent rights, established Lowry as the father of the modern era of wood preservation.

PRACTICAL EXPERIENCE
continuous research and development
longer lasting wood products
American Creosoting Company

Out of the past . . . experience for the future!

● There is no substitute for experience. And the American Creosoting Company has over fifty years' experience in wood preservation. There is no substitute for pioneering spirit. And the spirit that led Mr. C. B. Lowry to invent his Empty Cell Process and found the American Creosoting Company is still very much alive.

For instance, the American Creosoting Company has carried on a continuous program of research and development throughout the years, both in its own laboratories and through research grants to leading universities. During this period, hundreds of chemical substances and processes have been developed and tested by Amcreco and other leading organizations in an effort to find new and better treating materials.

Despite these efforts and others, Science has apparently not yet been able to find a new material that equals creosote as a low cost chemical for prolonging the service life of poles, piles, timbers and other construction woods. *And longer service life is the first and most important reason why you invest money in treated woods. In general, any other feature that a preservative might offer is of secondary importance to its protective qualities.* One reason why creosote has been, and still is, the most effective preservative is the fact that it contains not just one but over one hundred toxic ingredients.

One other fact has become evident through years of research—there is still no laboratory short cut for determining the long range value of a preservative or process. The only real test is the test of how the preservative stands up on the job over a long period of time. Amcreco creosoted materials have undergone this test for over fifty years now, and their record is proven —long, long years of service with great strength throughout the life of the wood, and high resistance to fungi, borers, insects and all natural enemies of wood.

Of course, effective creosote treatment to a large extent depends on the method of application. There must be careful scientific control at every step in the pressure treating process. During application, the preservative must be measured by precise equipment, as it is forced into the wood. Final retention, distribution and concentration must be checked continually and accurately to assure the buyer the best possible product.

This is the type of treatment that assures clean, easy to handle construction woods that will last for years and years on the job. This is the type of treatment that takes the gamble out of purchasing. This is the type of treatment that you get from Amcreco.

Also in an industry where so much depends on service, Amcreco has had the time and experience to build up the facilities necessary to give you the kind of service you require. Our plants and sales offices are strategically located for prompt domestic or export shipment.

Write our nearest office for estimates or quotations on treated Timbers, Bridge Ties, Cross Ties, Piles, Poles, Cross Arms and Conduit. We would appreciate an opportunity to quote on your needs.

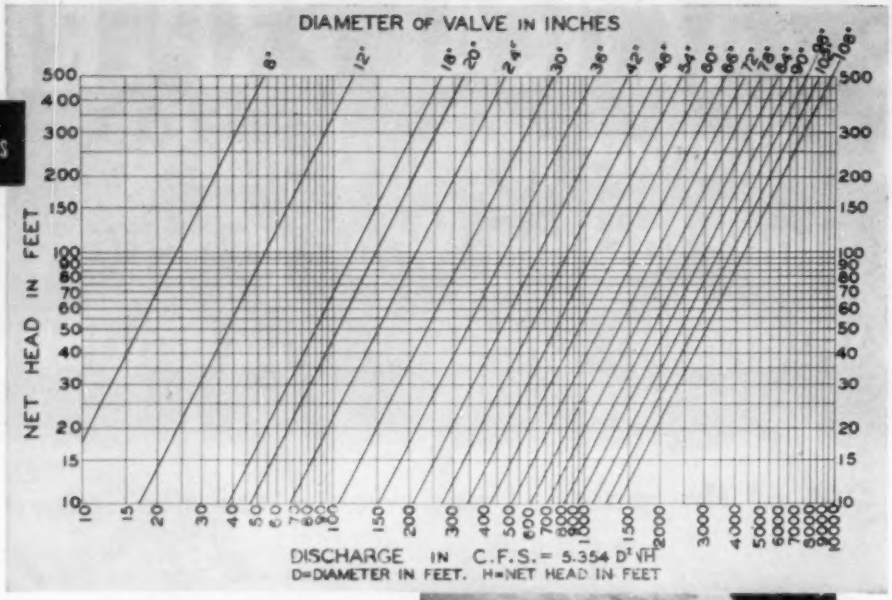
AMERICAN CREOSOTING COMPANY

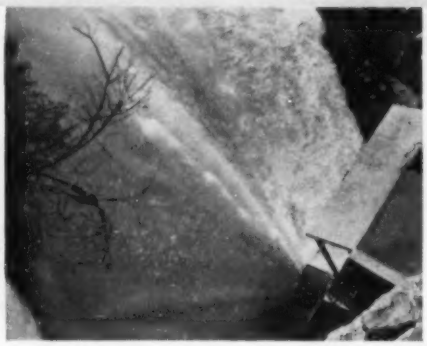
Shreveport Creosoting Company
Colonial Creosoting Company
Federal Creosoting Company
Indiana Creosoting Company

AMCREC
LOWRY PROCESS
CREOSOTED WOOD

Georgia Forest Products Company
Gulf States Creosoting Company
Georgia Creosoting Company
Kettle River Company

SMS
HOWELL-BUNGER VALVES





EASY REGULATION OF FREE DISCHARGE THROUGH HIGH TO LOW HEAD RANGE

SMS Howell-Bunger Valves provide easy regulation and control of water under free discharge. Tremendous amounts of energy can be dissipated with a minimum of erosion, cavitation and no vibration. Because of this valve's high discharge coefficient, pipe line or conduit size can be held to a minimum for economical construction.

The extremely rugged and simple design of the SMS Howell-Bunger Valve provides these essential features:

- Free discharge with safe energy dissipation
- Hydraulic balance without vibration
- High coefficient of discharge for an energy dissipating valve
- Minimum cavitation and maintenance
- Simplicity of operation
- Only one moving part in contact with stream flow
- Low initial cost
- Discharges into atmosphere or submerged.

S. Morgan Smith Company offers you more than 75 years experience with hydraulic equipment. The SMS name plate is your assurance that performance will equal or exceed specifications. For full information on Howell-Bunger Valves, turbines and related hydraulic equipment write the S. Morgan Smith Company, York, Pennsylvania.

Hydraulic Turbines
Pumps
Gates & Hoists
Trash Rakes
Accessories

HYDRODYNAMICS

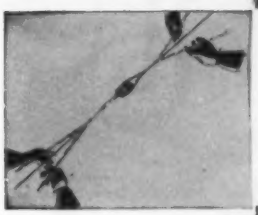
Rotovalves
Ball Valves
Butterfly Valves
Free-Discharge Valves
Controllable-Pitch Ship Propellers

S. MORGAN SMITH CO.

AFFILIATE: S. MORGAN SMITH, CANADA, LIMITED, TORONTO

GUY-GRIPS COST LESS

Here's Why



PREFORMED "GUY-GRIPS" are the fastest, most economical and most efficient means of dead-ending guys. They eliminate the need for clamps and ARE INSTALLED BY HAND. Since they cannot slip whether they are dead-ending a 2,000-pound, solid-wire guy or a 40,000-pound, ⅜" EHS steel guy, no retightening is ever necessary.

One large Utility has found that Preformed "Guy-Grips" save 50% on labor and 20% on material. Another assembles and installs a complete Preformed Guy Assembly (4 dead-ends) in the same time it used to take to assemble just one 3-bolt clamp.

PREFORMED "GUY-GRIPS" are proving definitely throughout the Country that they assure:

Maximum
- Corrosion Life
- Installed Tensile Strength
- Fatigue Characteristics
- Impact Strength
- Neatness in Appearance

Available in aluminum, copper, bronze (various grades including calsun), copperweld, stainless steel and galvanized steel, PREFORMED "GUY-GRIPS" assure the longest satisfactory guy life.

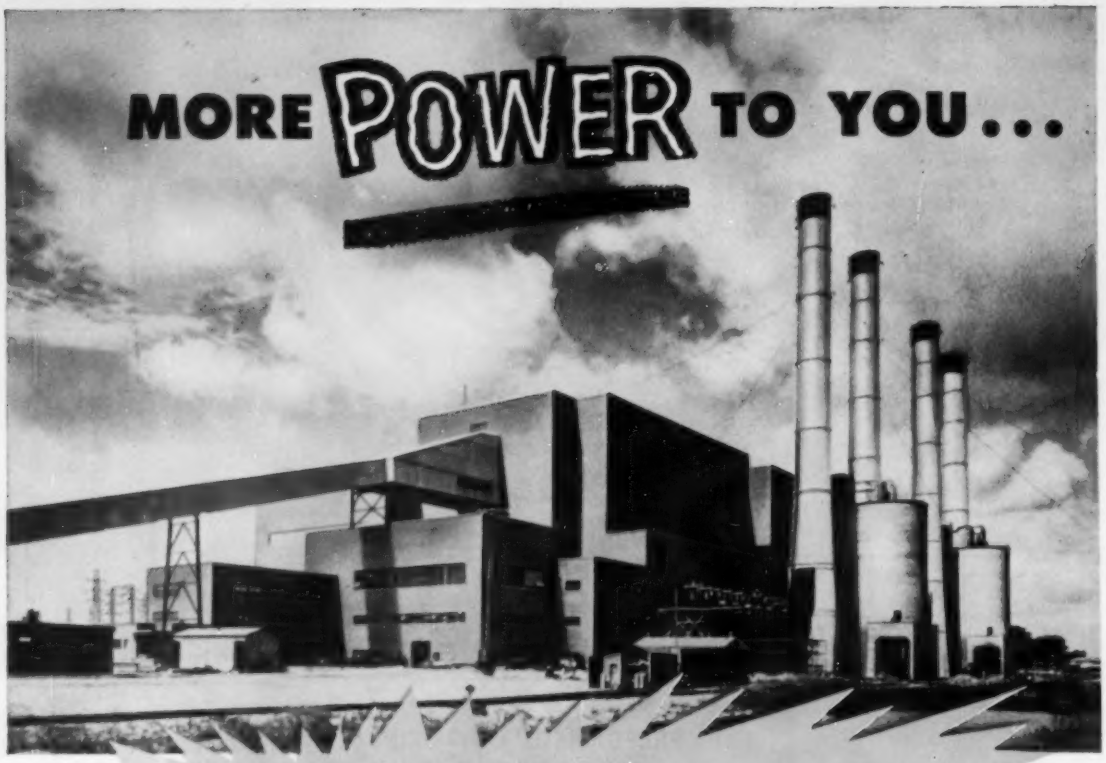
For complete details of their exclusive advantages, write, or telephone Cleveland: EXpress 1-3571.

PLP

PREFORMED LINE PRODUCTS CO.

5349 ST. CLAIR AVE. • CLEVELAND 3, OHIO

MORE POWER TO YOU...



Detroit Edison Plant boosts U.S. Electrical Capacity to 100,000,000 KW.

Detroit Edison's St. Clair plant boosts U. S. generating capacity to a new high. The latest St. Clair unit, rated at 156,250 kw., to go on the line brought the total U. S. electrical capacity to over 100 million kw. Shell Turbo Oil 27 was purchased as the lubricant for this unit as well as for the other three turbine generators in this plant.

Shell Oil Company extends heartiest congratulations to Detroit Edison Company for their part in achieving this industry milestone in electrical power.

Shell is proud of its long association with the great electrical industry.

SHELL OIL COMPANY

50 WEST 50TH STREET, NEW YORK 20, NEW YORK
100 BUSH STREET, SAN FRANCISCO 6, CALIFORNIA

SHELL

These SEC Polystyrene Capacitors have an accuracy in the order of 0.1% or better and longtime stability in the order of 0.03%. Natvar Styroflex film is used as the dielectric.

SOUTHERN ELECTRONICS CORPORATION, Burbank, California, manufactures precision capacitors for applications where difficult specifications have to be met, such as computer integrators, test equipment, secondary standards and certain weapons programs.

Because polystyrene comes closest to meeting specifications for a perfect dielectric, various polystyrene films were tested. Natvar Styroflex film was selected because of its uniformly excellent pliability, freedom from faults, high shock resistance and excellent dielectric characteristics.

Natvar Styroflex film is available in standard thicknesses From .0004" to .006" in widths from ½" to approximately 10" or in special put-ups to meet manufacturing requirements.

Natvar

Natvar Products

- Varnished cambric—cloth and tape
- Varnished canvas and duck
- Varnished silk and special rayon
- Varnished—Silicone coated Fiberglas
- Varnished papers—rope and kraft
- Slot coil combinations, Abaglas®
- Vinyl coated—varnished—lacquered tubing and sleeving
- Extruded vinyl tubing and tape
- Styroflex® flexible polystyrene tape
- Extruded identification markers

Ask for Catalog No. 23

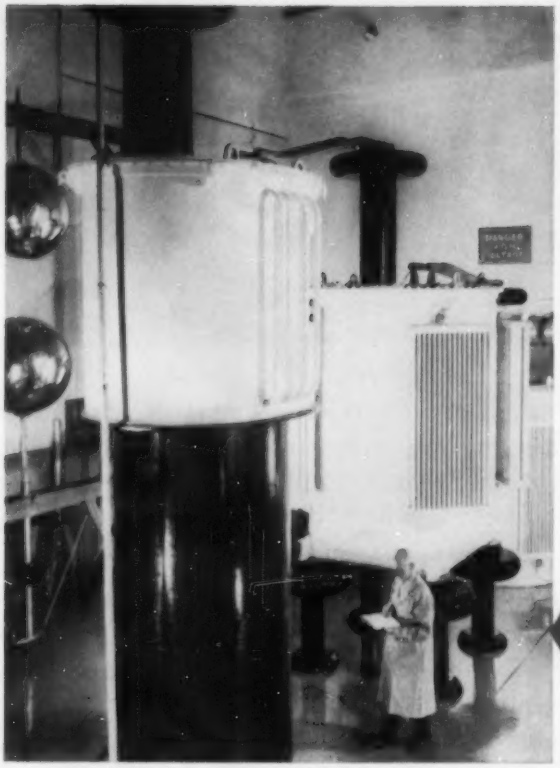
NATVAR CORPORATION

FORMERLY THE NATIONAL VARNISHED PRODUCTS CORPORATION

TELEPHONE RAHWAY 7-8800 — CABLE ADDRESS NATVAR: RAHWAY, N. J.

221 RANDOLPH AVENUE • WOODBRIDGE, NEW JERSEY

Phelps Dodge Research Sets The Pace For Modern Power Cable Design!



To keep step with modern electrical utility requirements for high voltage power cables, Phelps Dodge is constantly expanding and improving its research facilities.

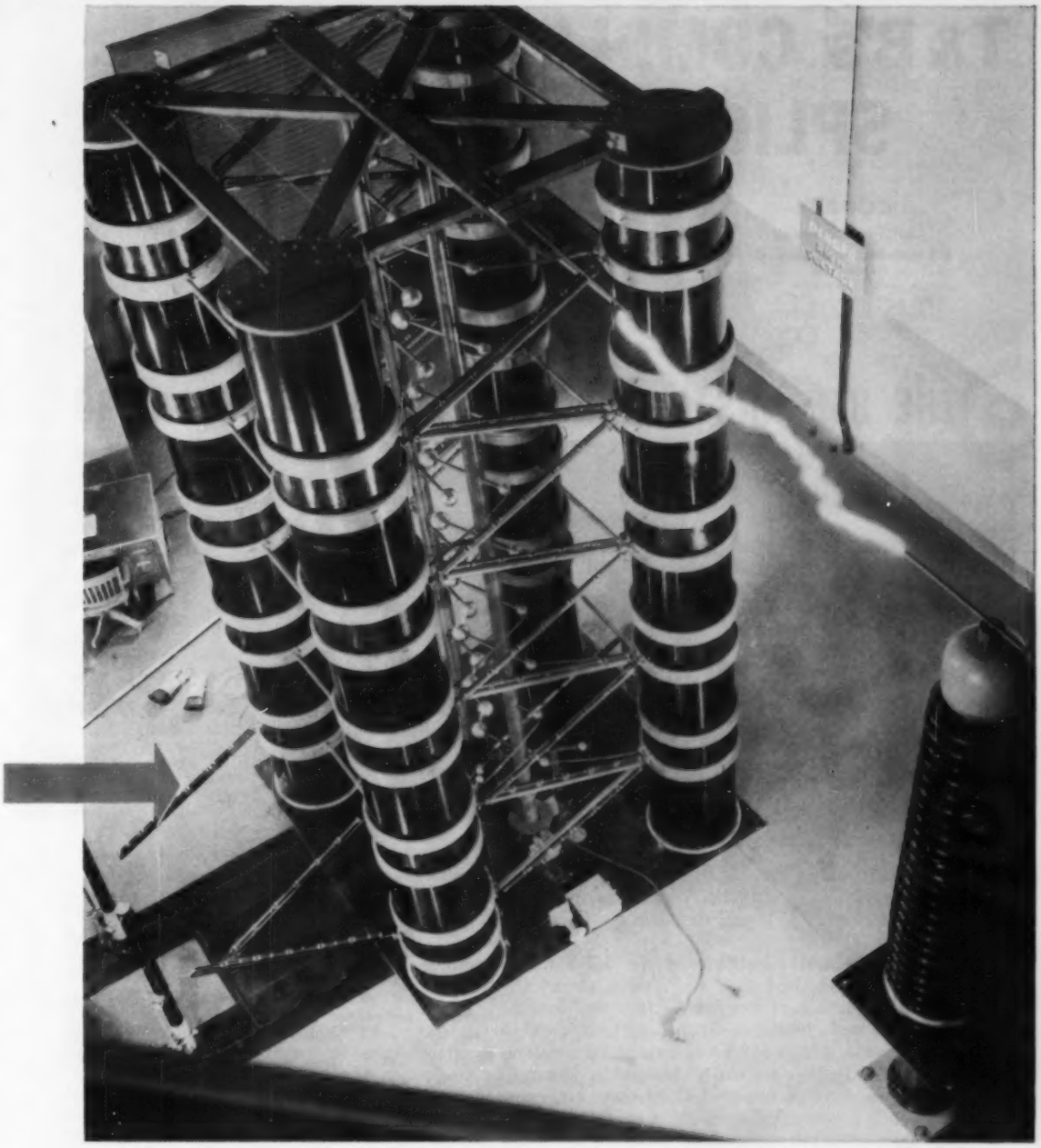
Phelps Dodge's million-dollar high voltage laboratory at Yonkers, N. Y., provides the latest power cable research devices operated by an experienced research engineering staff.

Impulse generator tests ability of new and improved cable insulations to withstand extra high voltage surges caused by lightning and similar disturbances in utility operations. Full-size cable samples are subjected to positive and negative polarity shocks up to two million volts.

High voltage test transformers of special construction supply stepped-up 60-cycle voltage to determine ability of new cable designs to resist both normal circuit voltages and overvoltages due to switching. This transformer bank is one of a number used by Phelps Dodge in its continual search for better, more efficient power cable. It supplies 60-cycle test pressures up to 750,000 volts.

Expert supervision is essential in use of this comprehensive test equipment. Every piece of Phelps Dodge power cable reflects the practical "know-how" and broad research experience of skilled engineers.

Consult Phelps Dodge about your power cable requirements—regardless of voltage or type.



PHELPS DODGE COPPER PRODUCTS
CORPORATION

40 WALL STREET, NEW YORK 5, N. Y.

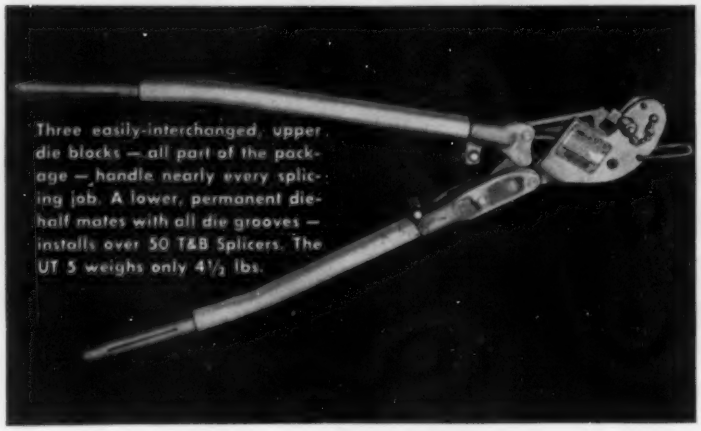
T&B's COMPLETE SPLICING PACKAGE *for*

COPPER
Solid and Stranded
#8 stranded to #2 stranded

ALUMINUM
Solid and Stranded
#6 solid to 2/0 stranded

A.C.S.R.
#6 (6x1) to 1/0 (6x1)

THE UT 5 INSTALLING TOOL...AND THE SPLICERS



Three easily-interchanged, upper die blocks — all part of the package — handle nearly every splicing job. A lower, permanent die-half mates with all die grooves — installs over 50 T&B Splicers. The UT 5 weighs only 4½ lbs.

One UT 5 Installing Tool is all that's needed to splice a wide range of service and distribution conductors. Switch to T&B and use *one* tool instead of many; slash tool costs and inventories to a minimum.

High mechanical advantage of the UT 5 tool minimizes manual effort required to make strong, electrically efficient splices. Hardened steel dies force splicer and conductor into a *square*-sectioned, homogeneous mass. Compound lower die design provides a high-unit-pressure area for installing the steel core of A.C.S.R. Dies are easily changed by loosening a single thumb screw. No tools required. Die grooves and connectors are conveniently letter-coded to assure proper die selection.

Let your T&B Distributor demonstrate the UT 5 and its many advantages . . . see how one UT 5 does the work of a dozen or more tools.

T&B Bulletin 71 gives the full story on the UT 5 Installing Tool and the wide range of T&B Splicers that it will install. Send for your *free* copy today.

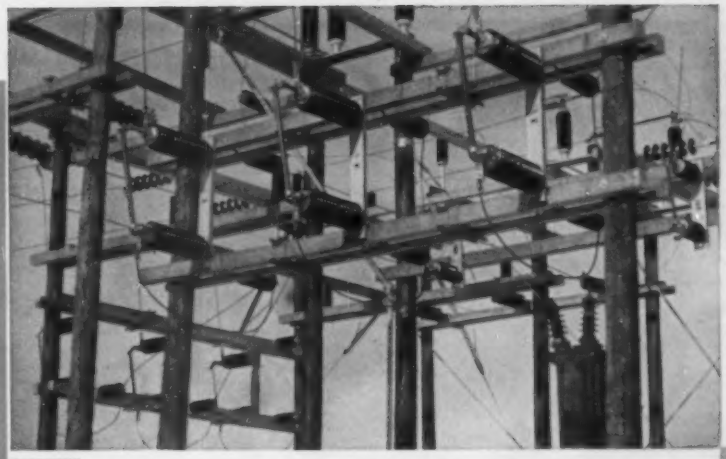
LOOK FOR THIS SIGN —

AUTHORIZED DISTRIBUTOR T&B ENGINEERED

IT'S THE MARK OF AN AUTHORIZED T & B DISTRIBUTOR

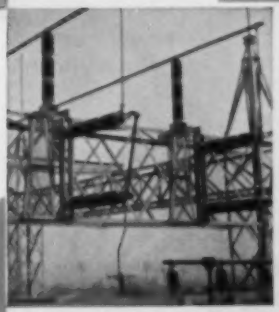
The complete line of T & B fittings for conductors and raceways is sold only by recognized electrical wholesalers. It's our way of assuring you the service and savings of a friendly local source. Call him for all your electrical needs. T-425

THE THOMAS & BETTS CO.
INCORPORATED
14 Butler Street • Elizabeth 1, New Jersey
Thomas & Betts Ltd., Montreal, P.Q., Canada
MANUFACTURERS OF QUALITY ELECTRICAL FITTINGS SINCE 1898



MAINE—The 69 kv B Series Power Fuses shown at the left are in service for Maine Public Service Company at Presque Isle.

TEXAS—Below are some 138 kv Type HMH-1 Power Fuses in service at a Texas utility's substation. The Type HMH-1 is available in interrupting ratings up to 30,000 amps.



SOUTHERN STATES POWER FUSES SAVE UTILITIES UP TO $45 EACH TIME A FUSE BLOWS

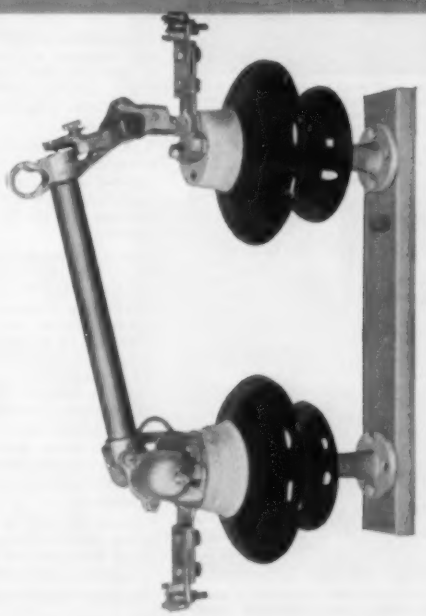
How much does it cost your company when a power fuse blows? Seventy cents to $3, or $5 to $50? By using inexpensive links instead of costly refills, Southern States power fuses may cut re-fusing costs as much as 800%.

There are additional savings, too. In a matter of minutes a lineman can re-fuse the unit, saving valuable time. No factory servicing is necessary. Expensive stocks of spares are eliminated. Less storage space is required. These all add up to savings too sizable to overlook. That is why utilities coast to coast are using Southern States Power Fuses.

These full dropout fuses are available to meet most requirements: Voltage ratings from 7.5-161 kv, continuous current ratings from 50-400 amps, and interrupting ratings up to 30,000 RMS amps. *Southern States Power Fuses have the highest interrupting capacity of any expulsion type fuse.*

They are not simply oversize cutouts, but have high mechanical strength to assure perfect performance for years, even after repeated operation. Snubber action allows the fuse holder to swing down to a cushioned, shock-free stop. Double-venting reduces shock force on insulators. Interchangeability of tubes permits increases in continuous current and interrupting ratings without changing fuse mountings.

Count the savings, check the advantages, and see why it will pay to use Southern States Power Fuses on your system.



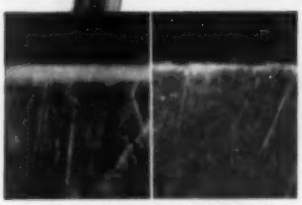
SOUTHERN STATES EQUIPMENT CORP.
HAMPTON, GEORGIA

IN CANADA: Dominion Cutout Co., Ltd., Toronto

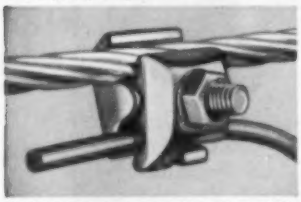
One AGP* clamp for all connections

ALUMINUM TO COPPER • COPPER TO COPPER
COPPER TO ALUMINUM • ALUMINUM TO ALUMINUM

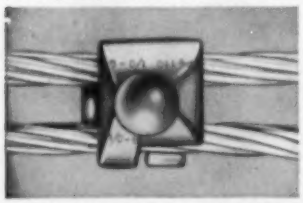
Protect your conductor with THE CLAMP THAT'S AHEAD OF THE TREND



Micro-photograph shows how high-density fortified cadmium, applied to a thickness of .001" on Chance AGP Clamps, compares with commercial plating at right.



Overlapping contacts on one side and a straight slide-in groove on the other help the attachment of the tap to the line.



Top view of clamp shows extra wide gripping jaws that contact all outside conductor strands in the entire size range.

Connecting copper and aluminum conductor requires a general purpose connector as good as the conductor itself in conductivity, mechanical stability and corrosion resistance, if future trouble on the line is to be avoided.

The best connector for this purpose is an aluminum bodied clamp with a *properly applied coating* of high density, fortified cadmium, proved best by every test for long-lasting, troublefree, general purpose connections.

That's what you get in the New Chance AGP Parallel Groove Clamp, companion to the widely tested and accepted Chance AGP Tap Clamp. The Chance PG110, shown above, can be used for any combination of aluminum or copper in a size range 1/0 ACSR to No. 6 copper *both sides*. This clamp is heavy in construction—yet light in weight. The high tensile strength bolt swivels into position without binding or bending. The wide jaws of this clamp contact every strand of any conductor in the entire size range. Rounded edges protect the conductor against damage from vibration.

Chance PG110 is your universal clamp for most applications. Larger sizes with the same features are also available. Write for complete information.

*Aluminum General Purpose

FORTIFIED CADMIUM ...proved best by test for joining aluminum and copper conductors

Read these Statements!

They're from leading manufacturers of aluminum conductor, power companies, and research laboratories. (Names on request).

"Where outdoor weather resistance is required, *cadmium is the best metal to deposit on aluminum.*"—Laboratory.

"This is the most logical solution to the problem of making aluminum to copper connections."—Conductor Manufacturer

"All factors considered—corrosion, electrical requirements, service—cadmium plated aluminum connectors, plated according to the method used by the Chance Company, are the best possible combination for use on aluminum conductor, for aluminum or copper taps."—Conductor Manufacturer

"Your AGP connector, cadmium clad as you do it, is going to solve one of our greatest problems of making lasting A and C connections."—Power Company

"The value of cadmium plated coatings has been completely demonstrated. Their high resistance to atmosphere, corrosion, to salt spray and to alkali has made them outstanding as a corrosion-resistant coating."—Laboratory.

"I prefer cadmium because of its outstanding resistance to corrosion in contact with aluminum and because of its inherent low contact resistance."—Conductor Manufacturer

"Our research laboratory found an average cadmium coated thickness of .002" on your AGP clamps. This is considerably more than the .0005" coating implied by ASTM specification A-165 Type N.B."—Aluminum Manufacturer

"Your AGP clamps were subjected to approximately 500 hours in a humid sulphide atmosphere and after cleaning to remove the sulphide coating which had formed on the exterior they showed no evidence of a breakdown of the fortified cadmium plating."—Eastern Utility

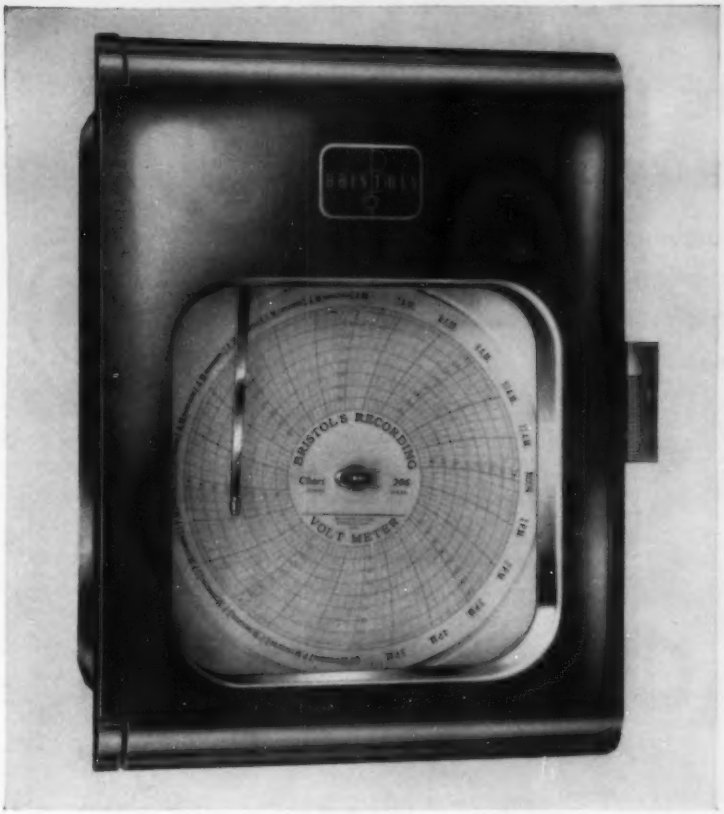
ABC INDUSTRIES

A·B·CHANCE CO·

CENTRALIA, MISSOURI

SAN FRANCISCO, CALIFORNIA

CC59-11



NEW, EASY-TO-READ BRISTOL RECORDING VOLTMETERS AND AMMETERS are available for permanent mounting or for use as portable instruments.

You'll get greater accuracy, greater dependability with Bristol recording voltmeters and ammeters

Here's why:

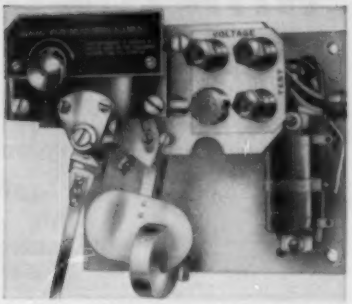
1. Low electrical burden — the lowest burden of any round-chart recorder on the market.
2. Extremely high torque gradient.
3. Temperature compensation.
4. Shock-proof measuring mechanism mounting.
5. Leveling of instrument not critical.
6. Continuously legible recording of sudden changes — up to full scale value.

These modern units are designed for easy use, with dust- and moisture-proof die-cast aluminum case; quick-set chart hub for easy chart changing; non-obscuring pen lifter; and snap-on chart plate.

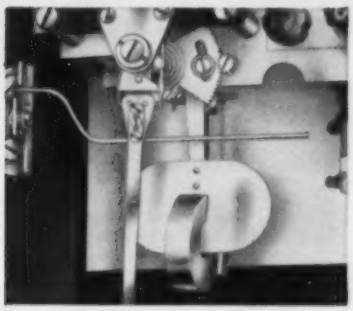
Get the whole story on these precision instruments. Write today for free 28-page Bulletin E1111 to THE BRISTOL COMPANY, 116 Bristol Road, Waterbury 20, Conn.

Many ranges carried in stock for immediate delivery

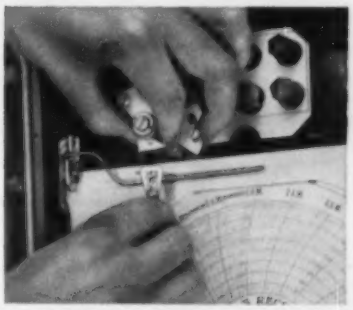
LOOK AT THESE FEATURES!



NEW MEASURING MECHANISM — High-quality, accurate, dependable Bristol moving-iron mechanism used in all models.



MAGNETIC DAMPING — all models equipped with aluminum vane and alnico magnet damper which gives maximum speed of response possible with minimum overshoot.



PEN MOUNTING — Pen-arm mounting shaft firmly supported at both ends — eliminates trouble from back-lash and lost motion. Pen arm is readily removed and replaced.

BRISTOL

POINTS THE WAY IN HUMAN-ENGINEERED INSTRUMENTATION

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

KEEPING UP WITH TOMORROW:

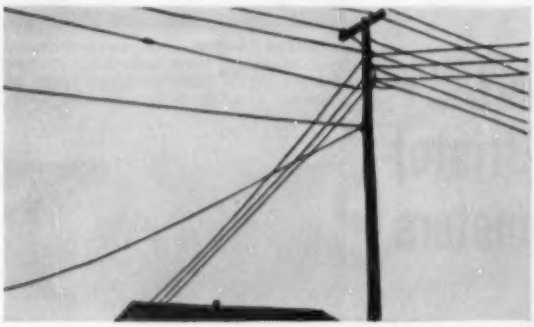
Depend on Reynolds Aluminum for All That's New in Electrical Applications. New Design, New Engineering, New Facilities to Produce

Progressive Thinking is the keynote of Reynolds competent staff. Unhampered by precedent, yet tempered by experience, these men offer complete aluminum design, engineering, construction and production service.

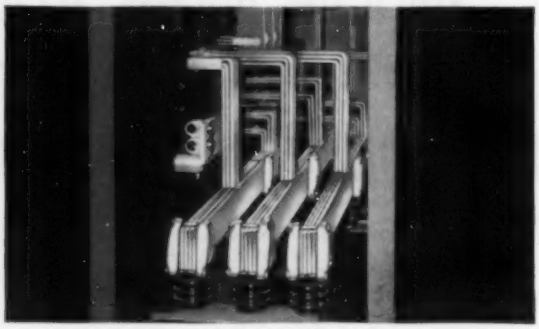
Expanding Facilities. This is a view of a section of the large, new cable stranding department at Reynolds Listerhill, Alabama plant. From this spacious, well-equipped cable mill come Reynolds ACSR and All-Aluminum Cable.

To Reynolds, each design, construction or production problem is a *new* problem—and the problems of no two customers are the same. Thus, you are assured of individual attention to your electrical aluminum needs. You are assured of products that meet or exceed your specifications. You are assured of a *complete* aluminum service by modern thinking men who think in terms of tomorrow's needs *today*. You are assured of the latest production facilities and methods to keep quality high, costs low.

In short, when you name Reynolds as your key supplier of ACSR, covered conductor, RABC bus conductor or aluminum for any electrical application, you are assured of all that's *new!*



Neoprene covered aluminum conductors are offered by Reynolds in single conductors and self-supporting secondary and service drop cables—duplex, triplex and quadruplex.



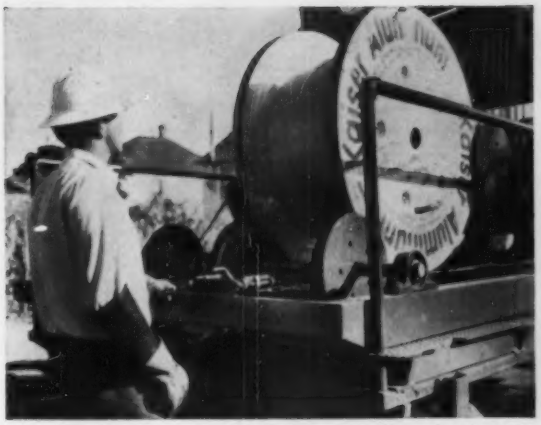
Typical RABC (Reynolds Aluminum Bus Conductor) application in electrical control equipment. RABC offers tremendous new advantages in sizes, shapes and versatility. RABC also costs less than conductor made of other metals; gives more conductivity per dollar; is strong yet lighter in weight (guaranteed minimums: 29,000 psi tensile; 25,000 psi yield; 55% IACS conductivity).

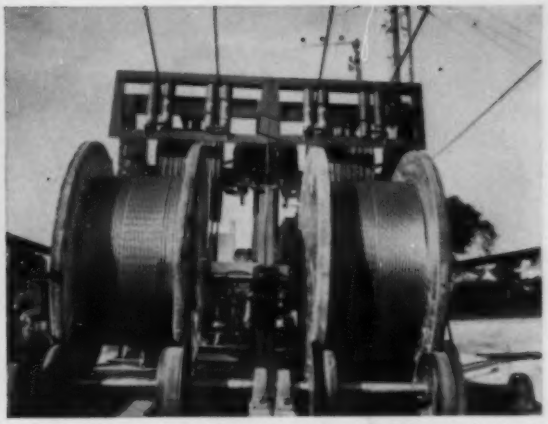
For full details about Reynolds Aluminum products for the Electrical Industry or for the assistance of Reynolds Electrical Engineering Service, call your nearest Reynolds Branch Office or write Reynolds Metals Company, 2584 South Third Street, Louisville 1, Kentucky.

See "Mister Peepers", starring Wally Cox, Sunday nights on NBC-TV.

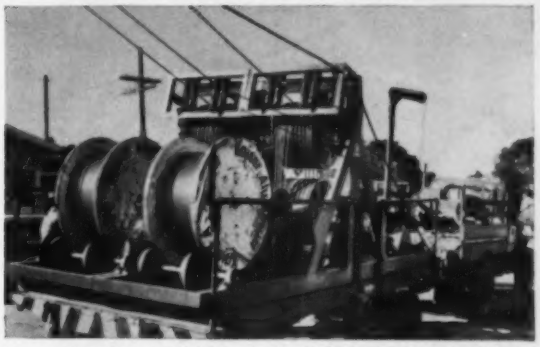
REYNOLDS ALUMINUM

MODERN DESIGN HAS ALUMINUM IN MIND





Attendant regulates tension (left) by means of cranks. At right: Reels at each end of machine ride on flanged rubber-tired wheels.



Four pairs of grooved bull wheels (left) hold tension. Right: Tension is so uniform that conductors are tied in without sagging.

Wires Strung Under Tension

Advantages of stringing several transmission or distribution conductors under tension at the same time are so great that there is now a definite trend in that direction.

The first equipment of this kind to be used by Pacific Gas and Electric Co. was employed recently in stringing a 266,800-cir-mil, all-aluminum 22-kv line at Pacific Grove, Calif. The device, made by the Petersen Engineering Co. of Santa Clara, Calif., is shown in the accompanying photographs.

This particular machine strings up to 4 conductors under tension up to 477 MCM, and is known as Series 5000. Series 6000 takes conductors up to 1 million CM, and Series 7000 to take conductors to 2" diameter is under development. As may be seen, there are four sets of grooved drums or "bull" wheels 26 inches in diameter, around each of which there are four wraps of the wire to prevent slippage. Grooves are neoprene lined to prevent damage to the conductor and further to insure against any possible slippage. Vertical rubber rollers guide the wire on and off the bull wheels.

On the shaft of each of the bull wheels there is a smooth acting brake of the type used for emergency braking on heavy earth-moving equipment. A small flexible steel cable leads from each pair of these brakes to a crank on the bed of the machine, giving perfect control over braking of the bull wheels.

An interesting feature of the design is the manner in which the reels of cable are supported. Two shafts with flanged rubber-tired wheels are ajustable so that the rim of any sized cable reel rides on these rubber tires. A brake on each shaft of the same type as that used on the bull wheels permits the degree of retardation necessary to keep the conductor under tension between the reel and the first bull wheel.

After a few pulls, an interesting thing develops.

The braking system permits such nicety of control over total tension in the conductors and relative tension between conductors that it is possible to dead-end and tie in directly without any sagging operation, thus effecting a considerable saving in time. Primary purpose of the tension stringing is, of course, to keep the conductors out of hot 4-kv primary and other circuits below. Even though there is little possibility of contact with hot lines with tension stringing, nevertheless the machine is grounded as a safety precaution.

Those familiar with line construction predict that tension stringing will soon become general practice, even on new work where no other lines are involved.

Made by the makers of the World-Famous

PENGO EARTH AUGERS

PETERSEN

ENGINEERING COMPANY

Santa Clara, Calif.

Send Coupon for More Information!

PETERSEN ENGINEERING CO.

Santa Clara, California Dept. 4

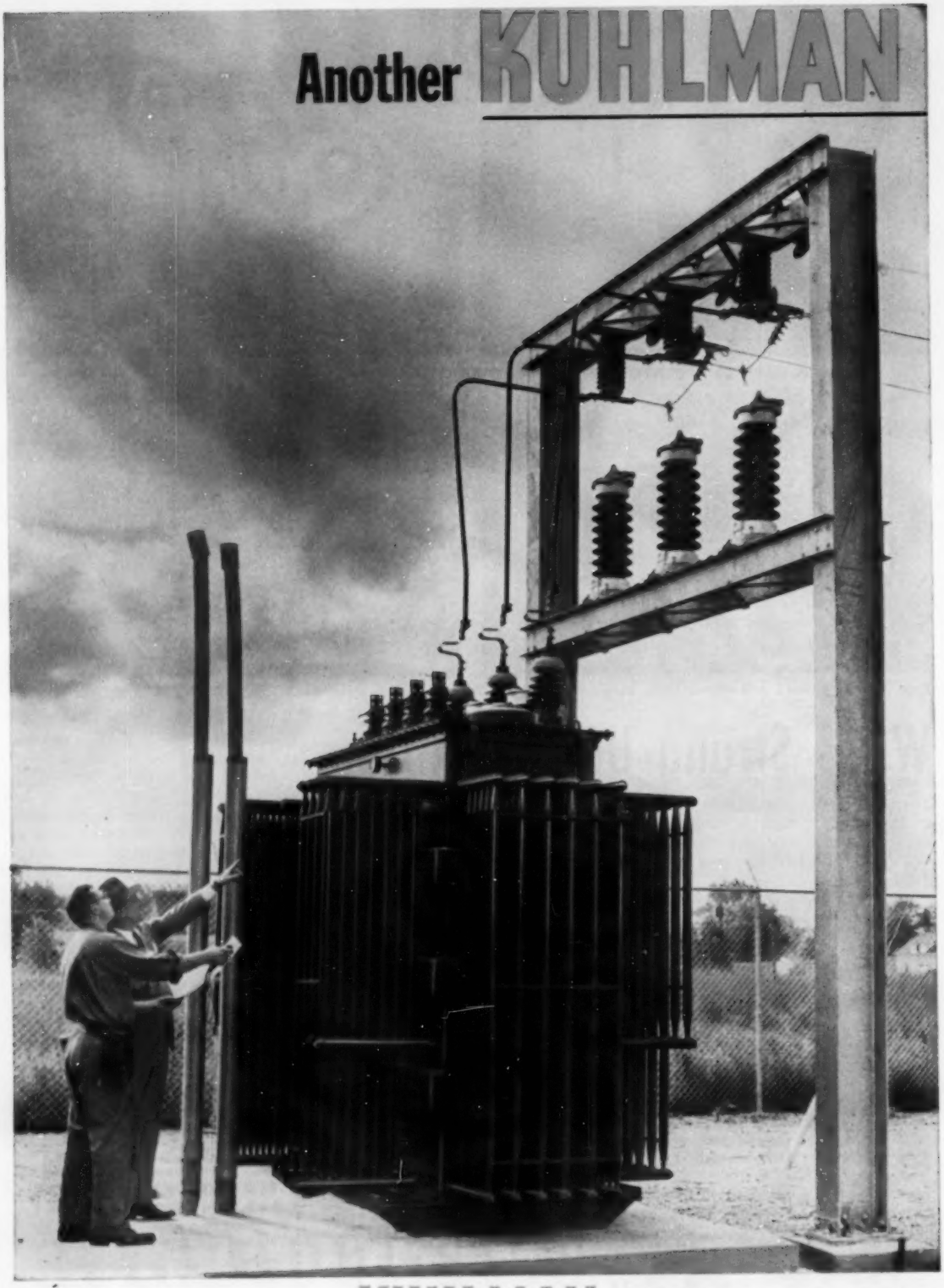
Please send me more information on the new Pengo Tension Wire Stringer.

Name_____

Firm_____

Address_____

City_____ State_____



KUHLMAN

KUHLMAN ELECTRIC COMPANY

power transformer goes into service

After over sixty years of supplying the nation's leading utilities with dependable transformers, Kuhlman still remains exclusively an independent transformer manufacturer. As a result of this specialization, Kuhlman has been able to refine the art of transformer craftsmanship and build a reputation for reliability and quality manufacturing — just one of the many reasons for selecting a Kuhlman Power Transformer.

Today, Kuhlman offers a complete line of small Power Transformers to serve your utility's expanding residential and industrial needs. The photograph at the left, showing a 2500 KVA 3-phase Power Transformer being installed to serve a new mid-west suburb is typical of the preference shown by satisfied Kuhlman customers who consistently reorder Kuhlman Transformers because of the record of their past performance.

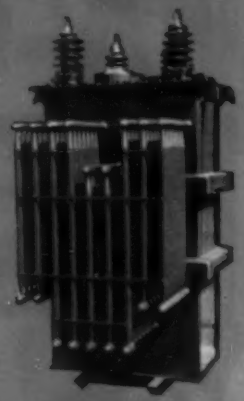
Select the Kuhlman Transformer that best suits your requirements and join the many old and new Kuhlman friends who specify Kuhlman Transformers because of these and many other time-tested features.

core and coil

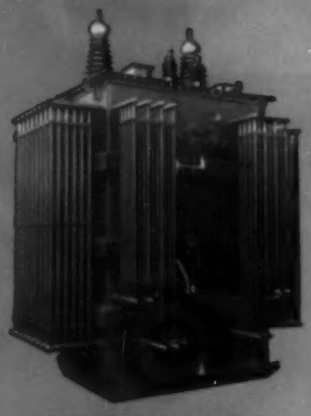
1. All connections inside coil are brazed. Brazed connections used for heavy bus outside the coil.
2. Tap changers of rugged construction give high overload capacity and low temperature rise at contact.
3. Tank anchor pads lock core to tank.
4. Steel clamping rings hold coils solidly in place.

tank

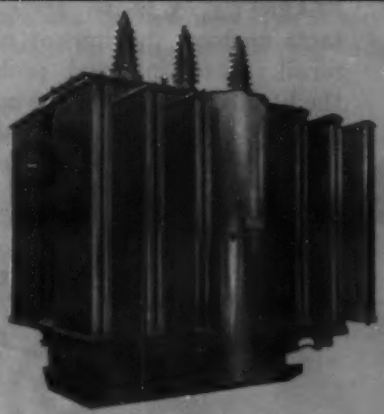
1. Tanks constructed of heavy steel plates meet latest NEMA ASA standards.
2. Seal Tanks minimize deterioration of oil.
3. Transformers can be vacuum filled in the field.
4. Metal stops in cover to assure proper gasket compression.



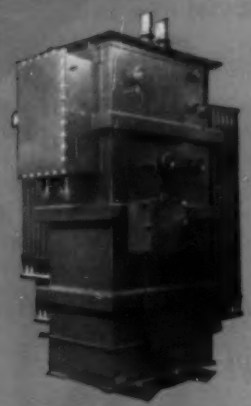
833 KVA Single phase 34.4 KV



3,333 KVA Single phase 67 KV



5,000 KVA Three phase 67 KV



1,677 KVA Single phase 67 KV

161

BAY CITY, MICHIGAN • CRYSTAL SPRINGS, MISSISSIPPI • SALINAS, CALIFORNIA

This weather protected housing means dependable service

with the KEARNEY TRIPOMATIC

Notice how the lead-in holes for the back-connected terminals *do not enter* the cartridge chamber. This eliminates the source of most troublesome dirt and moisture. And see how the contacts and hanger bracket are *bolted through* the massive porcelain wall. They can never pull out like cemented attachments.

KEARNEY's exclusive *spring* contacts cushion the impact of tube recoil, protecting and prolonging the life of the cutout. The contacts stay in adjustment for high contact pressure . . . even after long service.

274

For Better Construction---Safer Maintenance

JAMES R. KEARNEY CORPORATION ST. LOUIS, MO. GUELPH, ONT.

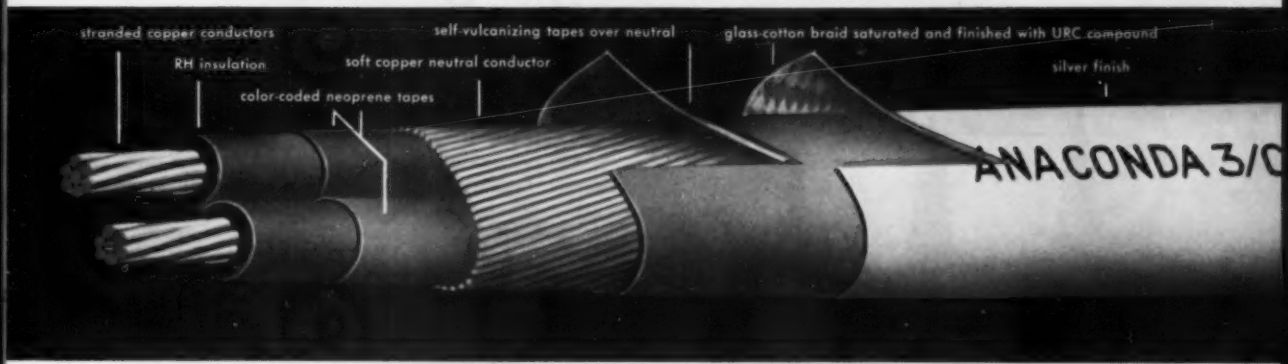
Specify **KEARNEY PRODUCTS** *The Mark of Quality*

JAMES R. KEARNEY CORPORATION • 4234-42 CLAYTON AVENUE, ST. LOUIS 10, MISSOURI • Canadian Plant: GUELPH, ONTARIO

ANACONDA ANNOUNCES—NEW

SILVALINE 100-AMP service entrance cable

The *only* SE cable with URC† saturant and finish



Here's a new Underwriters Type SE service entrance cable that complies with NAHB Voluntary Adequate Wiring Code... and will help you boost kwhr sales.

The new Voluntary Adequate Wiring Code of the National Association of Home Builders calls for 100-amp service into the home.

Adequate capacity in service entrance for homes insures your future sales of electrical energy – because it removes the *initial* bottleneck to the sale of high-current appliances.

And now, Anaconda introduces the new Silvaline* 100-AMP (actually 115-amps) TYPE SE cable. Made with #2 AWG copper – and Type RH insulation.

Here are other advantages:

Uninterrupted Service. *Silvaline is the only service entrance cable with URC† saturant and finish* ... will not festoon or deteriorate. URC weather-proof protection will stay put – assures long life operation and eliminates trouble calls.

Eliminates Complaints: Silver finish on Silvaline takes any type or color of house paint... won't bleed through. Will not flake or peel. No complaints from homeowners when Silvaline is used.

Silvaline 100-AMP cable is now available. For more information, contact your local Anaconda representative or write: Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y. 58231B

*Reg. U.S. Pat. Off. †Utilities Research Commission

SILVALINE *service entrance cable*

ANACONDA®

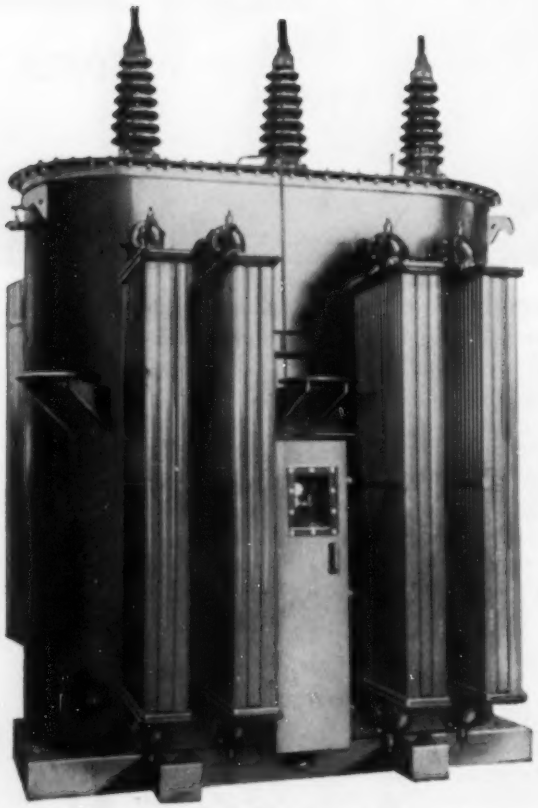
Power... at their fingertips...

Industries, commercial establishments, whole families all depend on reliable electric power as a motivating force for good production, effective lighting and essential home comforts.

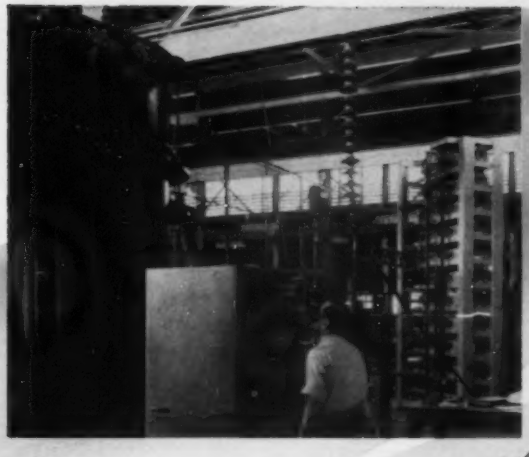
For 36 years Standard Transformer engineers, working with utility company engineers, have designed and manufactured better transformers for more efficient use and dependable channeling of electric power. Service records, dating years back, prove the dependability; the economy; the low maintenance cost of STANDARD Power Transformers.

STANDARD Power Transformers are embodied with compactness of design, inherent strength and exceptional stability. Manufactured with extreme care, STANDARD Power Transformers are built to your specifications. STANDARD engineers, working with your engineers, arrive at the best construction and design for your particular needs. Normal loads . . . and overloads can be handled again and again whenever emergencies arise.

There's a Standard Transformer representative near you. Call him. Have him help you with your power transformer installation.

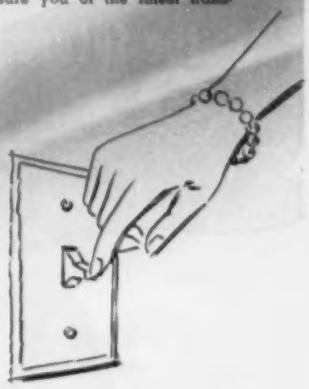


STANDARD Type AT, OISC Power Transformer, 7500 KVA, three-phase, 60-cycle, 66,000 to 13,800 volts, gas-seal construction, equipped with lightning arrester mountings and arranged for addition of forced air cooling.

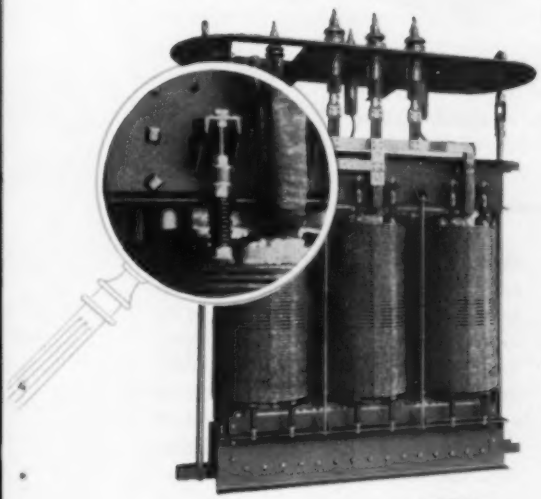


TESTING

This man is impulse testing a large Power Transformer in STANDARD'S modern plant at Warren, Ohio. A surge generator, with a range of one million volts, is used for ASA and NEMA standard and front-of-wave-impulse tests. Each transformer, no matter what the size, is subjected to standard commercial tests—both during manufacture and at completion. Experienced, thorough testing and inspection assure you of the finest transformer performance.

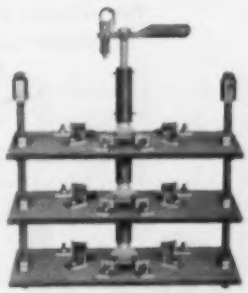


PUT THERE BY *Standard* TRADE MARK POWER TRANSFORMERS



TAP CHANGER

STANDARD'S specially designed three-deck tap changer switch is externally operated without excitation. It also has positive contact with wiping action which has proven dependable for many years. Normal settings are with a 4-tap voltage selection . . 2½% taps within 10% range of normal rating. STANDARD supplies transformers with 4 taps above or below, or half above and half below as specified by the customer at no extra cost. Contact-making points are submerged in oil.



CORE AND COIL ASSEMBLY

This view shows the low voltage side of the core and coil assembly of a Power Transformer. Note STANDARD'S special design spring bracing with compression-type porcelain insulators on high voltage coils to compensate for the movement of coils during short circuit. It also compensates for shrinkage of the coil in operation.

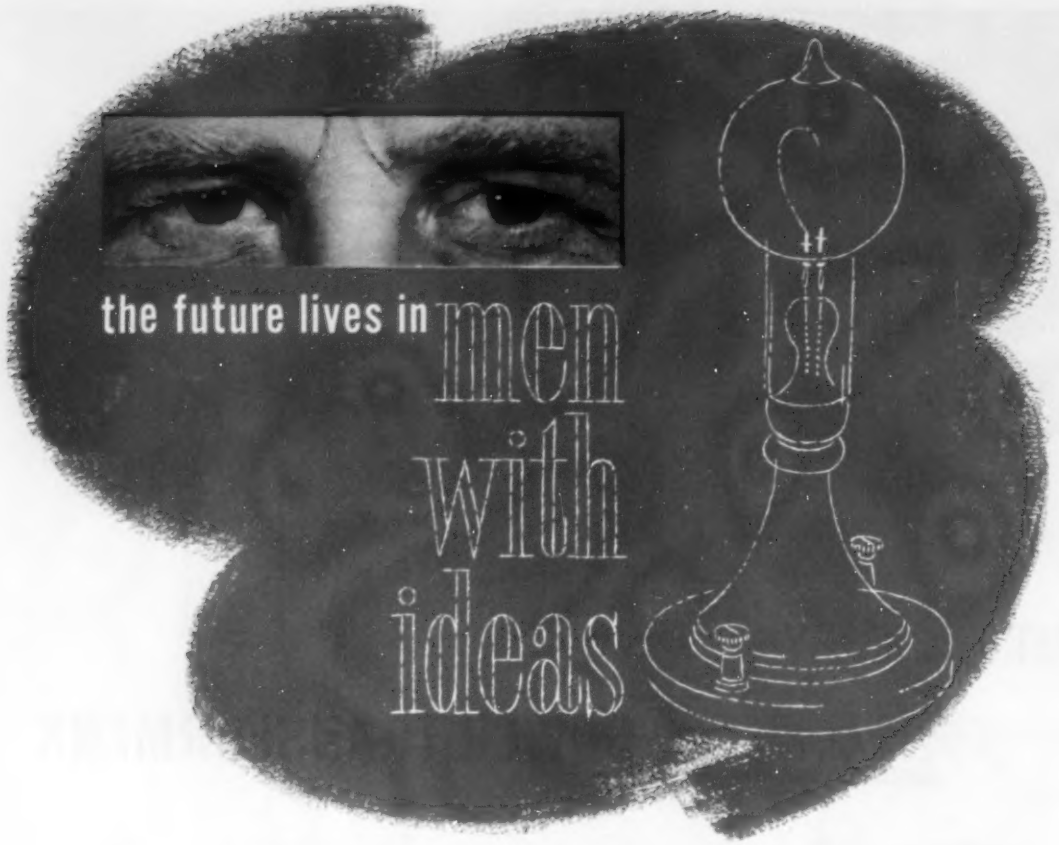
Standard

THE STANDARD TRANSFORMER COMPANY

Trade Mark

WARREN, OHIO

REPRESENTATIVES IN PRINCIPAL CITIES



The miracles of modern electric illumination were all foreshadowed by the glow of Edison's first lamp—implicit in the great IDEA. Also implied in this, as in all epoch-making inventions, were the corollary imagination and effort of thousands of unpublicized successors—pioneers of America's vital electric illuminating industry.

KERITE insulation was well established before the turn of the century. Already famous in telegraphic and signal applications, Kerite quickly won recognition for safety, dependability, and ultimate economy in the infant lighting and power industry . . . for the transmission of electric power via aerial, underground, and submarine cable.

By conscientious workmanship, careful handling, and a continuing search for new and better applications of its unique formula, The Kerite Company has been able to anticipate the power industry's needs. It will continue to apply itself to the technical world of "ideas" in which now, as in Edison's day, the future of America's power still lives.

The value and service life of a product can be no greater than the integrity and craftsmanship of its maker.

Founded 1854

KERITE CABLE

THE KERITE COMPANY—30 Church St., New York 7, N. Y.
Offices also at 122 S. Michigan Ave., Chicago; 582 Market St., San Francisco;
3901 San Fernando Rd., Glendale 4, Calif.; 31 St. James Ave., Boston

Electric Companies Stand Firm

In many ways the federal vs private power fight has come to focus in the Mississippi Valley Generating Co contract. Under this agreement a privately owned company would serve power to the Atomic Energy Commission.

Those who favor the further expansion of federally produced power have directed their fire and unremitting fury since early last summer at what has come to be called the Dixon-Yates contract. They are, indeed, still striving to kill it off during this anti-climactic period.

Some Democrats in Congress have sought to make opposition to the contract a matter of party loyalty. Their success and wisdom in this attempt will be treated in this space at a later date. But as the controversy now stands, the contract opponents have so confused the matter that it is of a very doubtful value to them as a political issue.

In the early stages of debate on the contract it is general knowledge that the nation's electric companies were disturbed and distressed at the barrage of criticism leveled at the industry. As was true with the public generally, the electric companies wanted to know more about the contract, its terms, and its significance.

During the intervening months that information has become available. The mystery has melted away, and the contract has been found to be, as we described it in our Oct. 4 issue (p 53), "a sound answer made by honest men with little to gain in the way of financial reward." AEC has made certain the return will be modest.

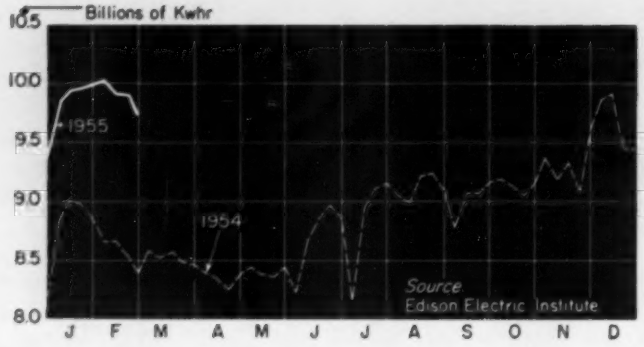
The electric companies voiced their position through Edison Electric Institute President Harold Quinton who wired Edgar Dixon, president of Middle South Utilities, Inc., and head of MVGC: "I am certain it is the general opinion of the electric industry that the Mississippi Valley Generating Co contract with AEC is a splendid example of cooperation between private citizens and the government" (EW, Feb. 14, p 9).

This statement by a recognized utility leader served to reject a plea by House Speaker Sam Rayburn that the utility companies prevail on Dixon and Eugene A. Yates, board chairman of the Southern Co, to withdraw the contract.

Much more significantly, the Quinton statement served public notice that the position taken by the electric companies cannot be whittled away by political invective.

The companies stand firm, and they stand together.

THE ELECTRICAL WEEK



OUTPUT

Week Ended Feb. 26

9,725,000,000 Kwhr
Up 15.8%

Per Cent Change from Previous Year

	Total US	New Eng.	Mid. Atlan.	Cent. Ind.	West Cent.	South-east	South Cent.	Rocky Mount.	Pacific NW	Pacific SW
Feb. 26	+15.8	+10.3	+ 9.5	+13.7	+9.3	+26.8	+10.0	+17.1	+13.4	+16.8
Feb. 19	+15.9	+9.2	+9.8	+15.9	+9.9	+28.9	+8.6	+16.4	+8.9	+11.2
Feb. 12	+14.3	+5.4	+6.8	+15.4	+8.4	+25.7	+12.0	+12.4	+8.9	+9.3

Seasonally Adjusted Index 183.3 Week Ago 185.0 Year Ago 157.6

The Issue's Highlights . . . Cyrus S. Eaton, once a power in utility field, re-enters industry. He confirms heavy reinvestments . . . Eisenhower-endorsed Upper Colorado River Project gets its first airing before new Congress . . . Corps of Engineers to hold hearings on Niagara power . . . Washington court gives Grant County PUD go ahead signal on its plans to build Priest Rapids . . . Interior recommends partnership development of Trinity River Project.

Georgia Power will obtain no financial benefits from its proposed contract to purchase power from Clark Hill dam, says Pres Harllee Branch, Jr. All financial benefits will be passed on to the co-ops. The company's only benefit, Branch adds, will be preservation of its system, representing a $390-million investment.

U. S. Supreme Court rules that SEC has authority under utility holding company act to pass on and cut back fees paid financial advisers by holding company for work done in connection with reorganization plan filed by a subsidiary. Ruling (reversing U. S. Court of Appeals in New York) backed SEC's power to cut in half proposed $100,000 fee to be paid by Electric Bond & Share to Drexel & Co, a Philadelphia investment firm, which helped EB&S to reorganize its subsidiary, Electric P&L.

Arkansas P&L and co-ops have worked out compromises on controversial private-public power measures before Arkansas state legislature, and these have now become law. Compromise on allocation of territory stipulates that co-ops serving municipalities of less than 2,500 continue serving when population exceeds 2,500. But when co-op territory is annexed by municipality served by private utility, the private utility acquires the territory but must compensate the co-op for it. Another compromise permits construction of generating plants by co-ops.

Labor: The fact-finding panel appointed by Michigan's Gov G. Mennen Williams has told striking UWUA-CIO members at Consumers Power they must go back to work before the panel will begin consideration of the issue. Union is seeking 15¢ an hour wage increase. This and other benefits sought total about 55¢ an hour . . . Columbus & Southern Ohio Electric and IBEW-AFL agree on 4.6% wage increase.

Street cars and trolley buses owned by nation's transit systems continued to decline in 1954. Trolley buses owned totaled 6,824 compared with 6,958 in 1953, and 7,182 in 1952. Street cars fell to 6,900 from 7,990 in 1953 and 9,700 in 1952, according to the 33rd annual review of the industry by the McGraw-Hill publication, Bus Transportation, appearing in the February statistical issue.

NEWS OF THE INDUSTRY BRIEFLY TOLD

Atomic Power: "We'll come up with a reactor in the next couple of years to produce power as cheaply as any power produced by any heat element in this country," says Rep Carl T. Durham (D-N. C.), vice chairman of Joint Congressional Atomic Energy Committee . . . Public is expecting atomic power to come about faster than it can be done, and AEC should give more publicity to the problems, says Earle W. Mills, president, Foster-Wheeler Corp. He believes competitive atomic power won't come for 10-15 years.

Liquid Metal Fuel Reactor (LMFR) developed by Brookhaven National Laboratory is being evaluated by a group as possible power plant reactor. Babcock & Wilcox is leading the study group of 17 firms and organizations . . . AEC and American Society of Mechanical Engineers are sharing $25,000 cost of study of high temperature piping problems . . . Nuclear Development Associates has bought Consolidated Edison property in White Plains, N. Y. for its headquarters. NDA is also looking for Cleveland site to work on atomic powered airplane engine.

Synthetic lubricant of the phosphate-ester type, and fire-resistant, is being used experimentally by Con Edison of N. Y. in bearings and control system of a steam turbine driving a boiler feed pump at its Waterside station.

Blyth & Co group is offering $50 million first and refunding mortgage bonds 3⅜% due 1987 of Pacific G&E at 101.488% to yield 3.30% (see Financing Table p 204).

President Eisenhower has nominated William R. Connole, general counsel for Connecticut PUC, to FPC to succeed Nelson Lee Smith . . . AEC has named W. Kenneth Davis director of Reactor Development Division, replacing his ex-boss, Dr Lawrence R. Hafstad . . . New York's Gov Averell Harriman has reappointed William Wilson, and nominated Charles Poletti to the State Power Authority.

National Adequate Wiring Bureau has introduced single master package of materials to promote adequate wiring . . . Over strong opposition from British Columbia, Canadian House of Commons has approved bill to curb export of water power to U. S. Bill is aimed at killing Kaiser-Aluminum's Arrow Lakes project in B. C.

ABOUT PEOPLE IN THE INDUSTRY

Addressing California Municipal Utilities Association in Sacramento, Rep Clair Engle (D-Calif.), and chairman of House Interior and Insular Affairs Committee says, "If the partnership policy is adopted and put into effect, there will be no more low-cost public power, and public agencies such as represented in this annual meeting will no longer be able to secure such power on a preference basis, if at all."

When fog of political maneuvering is dispelled there remains one fundamental disagreement among proponents and opponents of Dixon-Yates contract, according to Harold A. Petit, vice president, South Carolina E&G. "Those who favor increasing government ownership of means of producing electricity are against Dixon-Yates contract. Those who oppose government ownership are for it." Contract has not curtailed TVA but it has "definitely interfered with TVA's unconcealed expansionist ambitions," he adds.

More News About People page 180

Because he sees a trend away from public to that of private ownership of electric utilities, the knowledge and experience of a former utility pioneer can again be useful to those companies in which he is investing, says . . .

Cyrus Eaton As He Buys Into Utilities

Cyrus S. Eaton, chairman of the Chesapeake & Ohio Railway Co, and once a power in the utility field, confirmed last week that he is reinvesting heavily in utility shares (EW, Feb. 28, p 6). Driven out of utilities by the Public Utility Holding Company Act of 1935, Eaton is coming back in because, he says, he sees the cycle swinging around in favor of private cnterprise again. But he is quick to deny any intention of attempting any utility mergers or consolidations.

Eaton's initial purchases of utility stock are reported to include "substantial" holdings in Kansas City Power & Light Co, and somewhere in the vicinity of 12,500 shares of common stock in Cleveland Electric Illuminating Co. Indications were that this figure might increase. CEI has 3,346,401 common shares outstanding. His purchases of KCP&L stock may make him one of the largest, if not the largest, stockholder. Eaton was in Kansas City in late February conferring with KCP&L officials about a place on the board of directors. It is also presumed that he has expressed similar wishes in the case of CEI.

Formerly Owned KCP&L . . . In buying into KCP&L, the 72-year-old, Nova Scotia-born financier has picked a company with which he has had previous association. His United Light & Power Co, a former holding concern, once owned KCP&L.

Eaton has also had a previous association with CEI. Back in 1947 he and his banking firm of Otis & Co tangled with CEI's Pres Elmer Lindseth over the utility's proposal to refund 254,989 shares of $4.50 preferred with new shares bearing a lower dividend rate. It was a negotiated sale with Dillon, Read & Co, New York, and Eaton and Otis wanted competitive bidding on the stock issue.

In reinvesting in utility shares his prime concern, says Eaton, is that the companies must have good management. On this subject of management, he also states, "I believe in professional management only up to a point. I believe that the officers of a company should have more than a salary interest in their company." The financier and industrialist speaks from a lifetime of business leadership.

Previous Utility Holdings Widespread . . . Although Eaton today is more familiarly known for his connection with iron and steel interests, his former utility holdings were tremendous. Currently he has substantial interest in six important iron and steel companies, in extensive iron ore deposits in Canada, in paint, and in coal (he is chairman of West Kentucky Coal Co). He is also a member of Otis & Co, Cleveland investment banking house.

Following an early business association with John D. Rockefeller, Sr, Eaton began his utility career with East Ohio Gas Co. In 1908 he organized Canada Gas & Electric Corp and built an electric power plant at Brandon, Manitoba, all on borrowed money. He sold out at a profit and used the money to widen his operations in the utility field. In 1912 he formed Continental Gas & Electric Co which consolidated a number of electric and gas companies in the Midwest.

Subsequently, United Light & Power Co, of which Eaton was chairman, acquired through yet another holding company subsidiary, United Light & Railway Co, over 99% of the stock of Continental G&E. Otis & Co, of which Eaton was then also a member, was a large stockholder in UL&P. When the government started cracking down

on the holding companies in the 1930's, the UL&P system consisted of some ten holding companies and 42 operating companies largely in Iowa, Missouri, and Nebraska.

The holdings in this system included such companies as Kansas City P&L, Iowa Power & Light Co, St. Joseph Power & Light Co, Eastern Kansas Utilities Co, and American Light & Traction Co.

Eaton also held varying interests in Detroit Edison Co; Consolidated Edison Co of New York; Brooklyn Union Gas Co; Brooklyn Borough Gas Co; Commonwealth Edison Co and Peoples Gas Co, both of Chicago; and many others.

The holding company act signaled the end of the vast Eaton enterprises. Otis & Co for a while fought the liquidation of United L&P, but the company finally succumbed in 1945. United L&P and Continental G&E companies were eventually liquidated in 1950.

CEI Management Good . . . Eaton said his buying of the CEI stock was "made as an investment in a progressive institution." He was emphatic that his investments in electric utilities would have to be in well-managed and alert companies. CEI filled that bill exactly, he said.

"Certainly no attempt at a change in management is contemplated by me —CEI has great management. CEI has done an outstanding job in engineering, and showed great foresight in building large power plants in advance of needs," Eaton said.

Holding Company Provisions . . . Eaton has made it clear that he has no intention of building another utility empire as he did before the 1930's. As an individual investor he is not likely to fall under the holding company act provisions. Under the law a stockholder does not have to file ownership reports with Securities and Exchange Commission unless he is an official or a director or a 10% owner of stock which is listed and registered on a stock exchange.

The act has never been used to make an individual subject to the same obligations and duties as a holding company. SEC has been able to attack the problem in another way. Where it has come up, the individual has owned the holding company that was involved and thus could be reached through the company.

Ike Backs Colorado Project

The $1.1-billion development is first of its kind supported by Eisenhower. Aandahl pushes Administration's endorsement

The huge $1.1 billion Upper Colorado River Storage Project—one of the biggest reclamation and power projects ever recommended, and the first large federal development of its type backed by the Eisenhower Administration—got its first airing before the new Congress last week.

Assistant Secretary of Interior Fred G. Aandahl led off for the Administration with a complete backing of the project. He underscored Eisenhower's strong endorsement, noting the Chief Executive's promise to ask for money promptly if it is authorized this year. With Aandahl were Bureau of Reclamation people who testified as to feasibility of engineering aspects of the 1 million kw power development, and its accompanying irrigation and reclamation features.

Two Dams Involved

Involved in the Administration plan are two large dams—Glen Canyon (800,000 kw) and Echo Park (200,000 kw). There is also 61,000 kw of capacity embodied in a dozen participating projects which are also part of the initial plan.

Indications last week were clear that there would be no trouble getting authorization from the Senate Interior subcommittee conducting the hearings. Outlook for approval from the full committee and the Senate itself is the best ever. But, House particularly will be rough with lower California Congressmen joining conservationists in opposing the project.

There are several other bills pending. One of these envisions a more comprehensive initial plan calling for immediate construction of six large power units. But Administration's two-dam proposal has the best chance.

The only objector in the initial session was Sen Thomas H. Kuchel, Jr, (R-Calif.) spokesman for lower basin groups. He wanted assurance that California's rights to Colorado River water would be protected. He didn't get it at the outset.

Lower basin areas are not getting more than their guaranteed 7.5 million acre-ft yearly average flow. They're afraid that, if large dams are built and extensive irrigation facilities are implanted upstream, their flow will be gauged to upper basin needs a little too closely for their comfort. Kuchel said as much in asking Reclamation Commissioner Wilbur Dexheimer if the Administration's bill would protect the lower basin water supply.

Dexheimer said he frankly didn't know. He directed his testimony to the feasibility of the plan, and left it to others to determine what would happen to lower basin supplies during low-water years.

Eisenhower has not yet asked for money for any of the project. He estimated in his Budget Message entire cost of the two most important units —Glen Canyon (the key to the whole system) and Echo Park Dams—at $1.1 billion, and earmarked about $5 million for the first year to be asked for when the project is approved. No estimate is available on cost of the whole system.

E. O. Larson, regional Bureau of Reclamation director at Salt Lake City, presented to the subcommittee detailed statistics on Glen Canyon and Echo Park and the 11 participating projects using upper basin water for irrigation. He recommended early construction of the power plants.

Larson gave the committee cost figures (shown below) first presented last March by the Bureau of the Budget, which recommended financing the project through the use of a special revolving fund in the Treasury.

Statistics for Upper Colorado River Storage Project

Project	Installed Power Kw	Storage Acre Ft.	Cost (Mil.)
Glen Canyon	800,000	26,000,000	$421
Echo Park	200,000	6,460,000	177
Recreation-Dinosaur			21
Participating Projects	61,000		311
Total Cost			$930 Million

Corps Sets Niagara Hearings

Army Engineers schedules public sessions in Buffalo, N. Y., March 24-25 on its plan for more power at the Falls

Army Corps of Engineers has come up with alternative plans for development of 2.5 million kw of hydroelectric power on the Niagara River. The Engineers will air them in public hearings slated to be held in Buffalo, N. Y. March 24-25.

The overall Corps plan calls for initial installation of 1,723,000 kw of dependable capacity, with provision for ultimate development of 2.5 million kw. To get this, the Engineers propose an intake in the Niagara River, with either an unlined canal or a twin tunnel headrace, a 1,512,-000-kw power plant near Lewiston, a storage reservoir about a mile east of the power house connected to the Lewiston power plant by either a canal or a twin tunnel waterway, and a 330,000-hp pumping-generating plant at the reservoir with a maximum generating capacity of 270,000 kw.

Seeks Testimony on Financing . . . The Corps has not been charged by Congress with recommending whether the power should be developed with private or public money. It's interested in testimony on this question, but it wants to hear witnesses' views on this subject "only insofar as such action may have a bearing on the most feasible plan of development or the most beneficial use of the waters apportioned to the United States."

The Corps says its initial plan is economically justified. It estimates costs of alternative parts of the general plan as follows:

- Canal Plan—First cost, $366,010,-000. Annual carrying charges, public financing, $29,729,000; private financing, $46,449,000.
- Tunnel Plan—First cost, $416,-500,000. Annual carrying charges, public financing, $32,096,000; and for the private financing, $52,790,000.

For reasons of comparison: A 1949 report of the Federal Power Commission's Bureau of Power estimated costs at $308,700,000 if the project included covered canals, and $350,300,-000 using tunnels. At that time, net gains at nearby load centers were estimated at 1,115,000 kw. As late as the fall of 1951, the U. S. estimate of power from Lewiston was 1.3 million kw; it's now up to the 1.5 million kw mark for initial development of this plant.

Corps of Engineers originally favored canal construction over tunnels, because of lower costs, and indicated that federal development would be the best approach. It's now simply "laying forth engineering features," without recommendation. In drawing up these data, Corps officials consulted officials of N. Y. State Power Authority and other interested agencies.

The public hearings will run from 9 a.m. to 5 p.m. in Room 410, old Post Office Bldg., Swan and Ellicott Streets, Buffalo. They'll be run by Maj Gen B. L. Robinson, deputy chief of engineers for construction and chairman of Rivers and Harbors Board.

Await Hearings Outcome . . . Congressional units, which will receive the Engineers' report later this session, are sitting tight awaiting the outcome of the hearings. They have before them so far three bills, all of which call for private development of U. S. portion by five New York utilities.

Two of these were introduced in the house by Rep William E. Miller (R-N.Y.) and George Dondero (R-Mich.). Their bill is the same as S 6, by Sen Homer Capehart (R-Ind.).

No public power bills have yet been introduced. However, federal development is not lacking for support in this Democratic Congress, and it is expected that several pieces of legislation toward this end will appear when the Public Works Committees receive the Engineers' report. Presumably, there would be recurrences of the Case Bill (S 2599) which would leave it to FPC to decide if development should be by federal, state or private money.

Support for an FPC decision also comes from the Budget Bureau. This bureau has just recommended for a second time that the commission decide who should develop Niagara power. Budget Director Rowland Hughes last year advised against passage of other pending bills.

Power from Roanoke Project Is Not Far Off

First generating unit at Virginia Electric & Power Co's Roanoke Rapids hydroelectric project in North Carolina is expected to start spinning by the first of July. Three more units will follow by the first of next year, bringing the project's total capacity to 100,000 kw. Since the controversy over whether the hydro site should be developed by a utility company or the federal government was settled in favor of private enterprise, construction on the project has moved ahead rapidly. Vepco reports that 91% of the concrete for the project has been poured and 70% of the conduit work completed.

PUD Gets Nod on Priest Rapids

Washington court upholds order restraining power commission from building project Grant County seeks to construct

Grand County PUD of Ephrata, Wash., is free to proceed with its plans for proposed construction of Priest Rapids Dam on the Columbia River near the Atomic Energy Commission's Hanford Works, as the result of a decision by the Washington State Supreme Court.

The court upheld a Grant County superior court order restraining the State Power Commission from proceeding with its plans to build the $375-million project, ruling that the commission moved without authority in stepping into the situation and that the PUD had a prior right in the project.

Constitutional Question Remains . . . The court failed to rule, however, on whether the commission is a constitutional agency. The commission may continue the court action to get an answer to this question, in order that it may proceed with plans for the construction of steam generating plants. The PUD has expressed legal doubts as to the commission's constitutionality.

The PUD hopes to obtain the Federal Power Commission permit for the dam by June and start construction within two years. Before construction can be financed, however, it must find customers for the 1.1 million kw the dam will produce. Puget Sound Utilities Council, comprised of Seattle City Light, Tacoma City Light, Chelan and Snohomish County PUD's and Puget Sound Power & Light Co, has told the Grant County PUD it will buy a large block of the power if the price is right. However, the council believes the Chelan County PUD's proposed Rocky Reach Dam upstream on the Columbia may produce power at a lower cost.

"We can't undertake to buy power that won't be available for several years, at a price not yet determined, if we have reason to expect we can meet our own needs," said Paul J. Raver, Seattle City Light superintendent and chairman of the utilities council.

Offers Help . . . The Power Commission has offered to help the Grant County PUD in preparation of plans for Priest Rapids, provided that it receives the $1-million appropriation it has requested from the state legislature. Prospects for its receiving such funds are not too good, however. Rep John G. McCutchen of Tacoma, chairman of the House Public Utilities Committee and an opponent of the commission, has recommended that the requested appropriation be denied.

Steam Plant Proposal . . . The commission has a better chance of getting $275,000 for engineering studies of proposed steam-generating plants. Sites for the plants have not yet been selected but J. Frank Ward, the commission's managing director, told the Senate's Ways and Means and Public Utilities Committees that he personally favored locating one plant in the Cle Elum coal mining area, another in the Puget Sound area near the state's big population centers, and a third elsewhere in the state as determined by future studies, perhaps in the Centralia-Chehalis coal mining area. Spokesmen for the coal mining industry declared that steam plants would bring a new lease on life for the coal mines.

A bill now before the Senate would greatly weaken the commission. It would give public or private utility or operating agencies priority to construct power dams or generating facilities. The commission would be empowered to build only projects that no other agency wanted.

Electric System Parts to Undergo A-Bomb Test

Tests to indicate the relative vulnerability of electric system parts to atomic blasts and the nature of repair problems will be made by the Federal Civil Defense Administration next month. Electric power lines and other equipment will be set up at the Nevada Test Site for the next series of atomic bomb explosions.

The FCDA has invited the Edison Electric Institute to participate in the tests. The EEI has engaged the Bechtel Corp of San Francisco, Calif., to supervise the engineering construction of the electric test structures.

Civil defense officials and the electric utility industry are seriously concerned about the potential effect of atomic blast pressure on electric transmission and distribution lines, substations and other consumer facilities.

To obtain the desired information duplicate installations will be constructed at different distances from the test explosion and outside the area of total destruction.

Lighting the Wilds . . . Texas Style

Houston (Texas) police have swapped their six shooters for light meters in a drive to curb crime and delinquency in the city's beer taverns. To enforce an ordinance passed recently by the council requiring a minimum rating of five-foot candle lighting in all public eating and dining places, the cops are casing the joints with their trusty Westons.

Several barkeeps have already been hailed into court for inadequate lighting. One team of police issued a summons on the strength of their own eye-rating, which is almost certain to bring a test on the use of light meters for testing.

Following a test trip to about 30 night spots with a light intensity meter, Councilman Gail Reeves was convinced that: Adequate lighting could be obtained in Houston taverns by a requirement for two-foot candles instead of five under the new law; and furthermore, the new ordinance is so loosely written that it is doubtful it would be upheld by the courts if taken there by tavern owners.

Houston Lighting Co has received a number of frantic calls for aid in stepping up tavern lighting. One worried barkeep wanted to know where the dickens he could find a "five-foot candle" to light his place.

Records of the Grand Jury investigation which lead to the ordinance indicate the law was suggested in order to make it easier for witnesses to identify assailants.

Backs Trinity Partnership Plan

Interior recommends joint development of $220-million California project. PG&E offers to build facility

The Interior Department is recommending partnership development of the $220-million Trinity River Division of the Central Valley Project in northern California.

Former Interior Secretary Oscar Chapman two years ago asked Congress for $207 million to finance the project as a federal enterprise. His plan envisioned two large dams (Trinity and Lewiston) with power plants, and diversion tunnels to channel the Trinity River's waters into other units of the Central Valley Project.

The Bureau of Reclamation now has found it feasible for the government to build the dams and tunnels, while private enterprise builds the power plants and transmission facilities. Interior Secretary Douglas McKay has endorsed this, thereby ruling that the Administrations' policy of partnership —where possible—applies. This constitutes a department recommendation in favor of private development of the power facilities.

PG&E's Proposal . . . A formal proposal to Reclamation Bureau for partnership construction of the Trinity River Project has been made by Pacific Gas & Electric Co. The utility said its offer would provide at least $171 million more net revenue to federal, state, and local governments than if the project were constructed by the bureau alone.

PG&E's offer is to build the power generation and transmission facilities and to pay the government $3.5 million per year for the use of falling water developed by the project.

The department has just issued two reports, one dated last July, the other Jan. 19. The first recommended federal construction of the whole Trinity setup; the second, partnership. The latest report emphasizes that the government would save almost $65 million through partnership. Both were prepared by Clyde H. Spencer, Reclamation Bureau regional director at Sacramento.

In his overall report to McKay, Reclamation Commissioner W. A. Dexheimer insisted that, if partnership is undertaken, provision be made to insure an exchange of power between the Central Valley Project and the private developer, which in this case would be Pacific G&E. PG&E is eager to undertake the power phase, and in a letter dated a week earlier than the Dexheimer report, claimed it could install 362,300 kw of capacity, compared with the 233,000 kw contemplated by the bureau.

Here are other highlights of the report, which has been forwarded to the State of California and other agencies for comment:

- The development is planned to divert 704,000 acre-ft of water annually into the Central Valley of California to provide 1,190,000 acre-ft for the CVP. Trinity River storage would be 2.5 million acre-ft, rather than the 1.8 million acre-ft planned.
- 70,000 kw of steam capacity originally projected has been knocked out.
- Sale of falling water to PG&E under partnership would net the bureau $3,951,000 a year. Allocation of joint-use features costs to falling water under partnership would be $105,358,000. Amortized over 50 years at 2½% interest, this works out to the yearly falling water charge. Addition of interest would boost this 5%.
- Since the bureau's prime concern is pumping power for the CVP, partnership plans would include agreement for PG&E to support power required to pump to CVP.
- Total estimated cost of the development is $219,282,000. All this is reimbursable except $215,000 for recreation facilities, and $47,000 for fish protection. Private power construction would cut this $64,876,000.
- Raising installed capacity from 218,000 kw to 233,000 kw would increase Central Valley Project energy by 1,067,000,000 kwhr a year.

WASHINGTON CHECKLIST

Southwest Power — Southwestern Power Administration has negotiated a contract for the Northwest Electric Power Cooperative, Inc, of Missouri, to deliver SPA power. In disclosing the agreement to a Congressional appropriations subcommittee, Interior Secretary Douglas McKay said the contract should serve as a pattern for others in SPA and Southeastern Power Administration areas.

Atomic Power—The Atomic Energy Commission is trying to market power from General Electric Co's new submarine reactor at West Milton near Schenectady, N. Y. J. D. Anderson, AEC manager at Schenectady, is soliciting offers of purchase from preference customers in the area. He estimates there will be as much as 6 million kwhr of energy per year available, varying from 0 to 10,000 kw capacity as the unit goes through testing procedures. He already has an offer from Niagara-Mohawk Power Corp and has checked with other private utilities near the site.

Farm-Use—A sign of the expansion farm market and its demand on cooperative systems is this: A trend toward larger reserves for system improvements. Co-ops have traditionally put away about 5% for improvements, but Washington experts predict that within a few years they'll be laying away something approaching the 9-to-12% private utilities reserve for heavying up and improving equipment.

Bills Introduced:

Trinity River—To authorize a $455-million federal program for the Trinity River Division and the San Luis unit of the West San Joaquin Division of the Central Valley Project. (HR 4447)

Partnership—Rep Harris Ellsworth (R-Ore..) announced he was drawing up legislation for partnership financing of Cougar and Green Peter Dams.

TVA Financing . . .

. . . is being studied by a number of investment banking firms throughout the U. S.

Two investment banking groups have been formed to buy any bonds that may be issued to finance additional Tennessee Valley Authority steam plants. In addition two other banking concerns together are studying the TVA financing picture.

J. C. Bradford & Co, Nashville, Tenn., and Blyth & Co, New York, head one syndicate composed of 200 houses from coast to coast, J. C. Bradford, head of the Nashville firm, has revealed.

Equitable Securities Corp, Nashville, Tenn., Halsey, Stuart & Co, Chicago, Ill., and Smith, Barney & Co, New York, are managers of another large syndicate.

First Boston Corp, New York, and Lazard Freres & Co, New York, are the other banking firms interested.

Bradford said he had been "talking to high officials of TVA for two years on alternative means for financing expansion of TVA's steam generating power supply."

TVA Studies Alternatives . . . Brig Gen H. D. Vogel, appointed by President Eisenhower as new board chairman of TVA, announced during a speech in Nashville recently that TVA's staff is now studying all possible alternatives to the present appropriations method of financing.

At that time he predicted that TVA would be ready to recommend such a plan by March 1. However, since then TVA staff members have indicated that they will not be ready to recommend a plan for at least a month.

The TVA staff members are known to be considering at least five alternative proposals from which General Vogel has said the TVA board will pick one "as quickly as possible."

These five proposals include:

1. Financing by revenue bonds issued by a power authority of the State of Tennessee. The bonds would be tax free. Legislation for the authority already exists. TVA would build the plants and additions to the existing plants for the Tennessee state power board or authority. It would lease the completed plants from the state on a long-term basis. The amount of the lease payment would be the exact amount of interest and principal required annually to pay off the bonds.

2. The issuing of revenue bonds by TVA. Congress would be expected to give the bonds a tax-free status. It also would be expected to pass necessary legislation to free TVA of the need for seeking new plant authorizations of Congress.

3. The issuing of revenue bonds by TVA without a tax free status and with Congress retaining its present power to approve new construction and taking the additional power to pass on each TVA bond issue.

4. Establishment of an interstate compact authority to be created out of the seven TVA states which could issue bonds for new steam plants and eventually, if it chose, buy entire TVA system from federal government.

5. Issuing by the State of Tennessee of direct obligation bonds with the state to lease the plants to TVA.

Dixon Sees Action at His Plant Site

Edgar H. Dixon, center, president of the Middle South Utilities, Inc, and the newlyformed Mississippi Valley Generating Co, takes a look at the test pilings near West Memphis, Ark., for the proposed $107 million, 650,000-kw Dixon-Yates steam plant.

Engineers W. E. Hubbell, left, and T. H. Wylie, right, explain the big pilings which have heavy weights on them to test the soil strata. Heavy equipment has already been moved to the plant site.

Detroit Edison Orders Largest Transformer

Detroit Edison Co has ordered a 360,000-kva transformer, the largest in the world, from the Westinghouse Electric Corp.

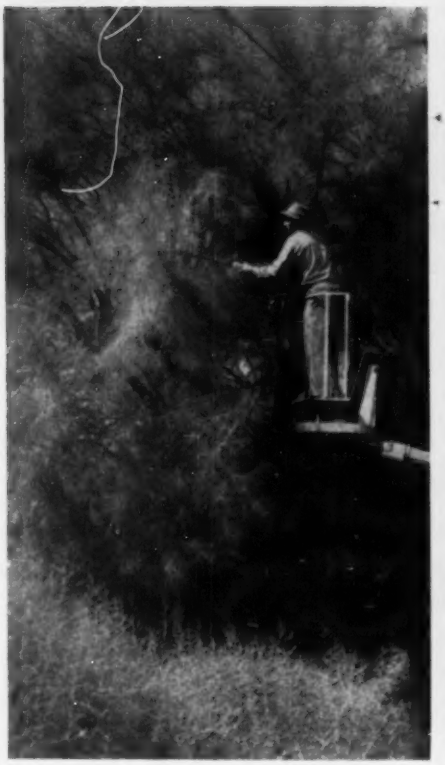
The three-phase, 60-cycle, forced-oil-air-cooled unit will be associated with the Detroit Edison Co's new 300,000 kw turbine-generator unit at the River Rouge plant to step up its voltage 17.3 kv to the 129-kv transmission voltage.

The highest rated transformers previously ordered were two 315,000 kva Westinghouse units that will be shipped this summer also to the River Rouge plant.

The 360,000-kva transformer will be only slightly larger than the 315,000 kva units in size and will be shipped upright in one piece, less coolers and bushings. It is scheduled for completion in late 1956.

Management

MICROWAVE communications unify and speed operations on far-flung system. Microwave repeaters are used throughout



JOHN T. KIMBALL
Vice President of Sales and Personnel*, Arizona Public Service Co, Phoenix

Expense control is a concept that can play an important part in increasing the efficiency of all phases of utility operation. Management must think in terms of providing acceptable service at a price customers are willing to pay.

A look at a utility operation shows that treasury and accounting methods and procedures ought to be two of the most powerful factors in expense control. As an example, a study of the expenses of customer accounting at Arizona Public Service Co revealed one avenue leading to lower costs. The company had a very detailed and painstaking method for keeping customers' records. The method of handling credit control tied up a lot of facilities and personnel. There was another set-up for customer accounting and bookkeeping.

Through analysis it was determined all that was needed was a bad-debt record. Now if customers don't pay, their records go into the bad-debt file. The elaborate customer history record has been eliminated and so has the facilities-file information. This information is being consolidated into a simple locator file, and 20 fewer clerks are needed.

The new attitude revolves around the fact that it isn't necessary to keep elaborate records merely to avoid a single mistake. No longer should the fear arise of taking a chance of losing a single meter, a meter reading, or a single customer in the file.

In the construction field the feeling has grown that a dollar spent will be returned in value received. But as in engineering and operation, construction dollars need to be guided by the application of expense control. To get the most from every construction dollar, full advantage must be taken of mechanized equipment.

At Public Service a five-man crew has been outfitted with a whole range of power tools. This crew is doing work that would require a larger crew outfitted in the standard fashion. This is the first step in providing power equipment to crews to increase productiveness.

For more efficient line construction, the company uses field-spun aluminum aerial secondary cable. This has made possible midspan taps, longer spans for pole economy, and a streamlined, more pleasing appearance. Electric service has been improved because of reduced voltage flicker. When this type of construction was started two years ago, it offered no savings over conventional crossarm or racked secondary construction. But, now that stringing of cable has become routine and hydraulic ladders are used in making service taps, worthwhile economies have resulted.

Expense control should include a study of communications. Among the recent developments are microwave for transmitting voice, telemetering, relaying, supervisory control for

*On Oct. 1, 1954, Kimball became vice president and general manager of Idaho Power Co, Boise.

Should Look to Expense Control

for a More Efficient Operation

HYDRAULIC equipment and tools allow more tree trimming to be done in less time than before. In addition to this labor saving, work is neater

substations, and many other system functions. Although its initial cost may be steep, microwave offers great opportunities for reducing operating costs and improving service. Allied to microwave through the basic use of electronics are billing, accounting, and inventory control. In these two fields only the surface has been scratched in the use of electronic applications.

Applied to transportation, expense control offered Public Service a sound way to reduce costs. Under proper supervision, connect and disconnect men take their trucks home at night to eliminate dead time in starting the next morning. They call in at 8 AM to get a list of jobs to be done.

This practice has relieved the dispatcher of a certain amount of communicating with the service crews. This last benefit is just as important because the dispatcher usually is tied up with regular dispatching duties in the early morning. The new operation is saving considerable money.

Under the concept of expense control, some thought could be given to the leasing of transportation equipment. Considerable attention has been given to the practice by Public Service, but savings are not apparent at this time. However, many corporations do save money through lease arrangements. The leasing of buildings also presents an opportunity to save money.

Centralization of records and services has brought economies into Public Service operation. As part of the service area, there is a big division including Phoenix, with three or four smaller outlying towns in two other divisions. All paper work for Phoenix and the outlying towns is being centralized at Phoenix. Dispatching, service calls, and calls for information from customers will be channeled into that office. Any follow-up call or order affecting the customer directly will be relayed to and handled by the service and construction crews located strategically within the 35-mile radius of the central office. Reduction of personnel through this centralization is the big saving.

FIELD-SPINNING of aluminum cable adds efficiency to line work, permits longer spans

ATTENDANCE IS HIGH, as shown in Philadelphia Electric Co photo. Students learn heating fundamentals that equip them for better jobs

IEC's Metal Sheath Heater Course

New York State Electric & Gas used "gimmicks" to help put the course over with its small industrial customers. Response was surprising; enthusiasm was unparalleled. Immediate results appeared, and new friendships emerged

A snow storm engulfed the Binghamton area on the night that New York State Electric & Gas Corp had scheduled the third session of its industrial heating conference. Some of the student-participants had to drive 70 miles to attend. Despite gloomy predictions of Instructors I. E. Pierce and W. M. Farrell, most of the seats were filled at 7:30 o'clock.

The attendance that night dramatizes a singular success—NYSEG's success at catching and holding the interest of its industrial customers with something mutually beneficial. This "something" is a nutshell course aimed at teaching industry's myriad electricians and plant engineers to design and make simple 500-to-5,000-w electric heating installations without outside help. How, and with what result, NYSEG enticed men to drive through a blizzard after putting in a full workday provided the reason for this article—for you can apply NYSEG's experience when giving this course to your own industrial customers. Here are the details.

A Bit of Background . . . Conceived about four years ago by George Duerr and Carl Hartwig, West Penn Power Co, the Metal Sheath Electric Heater Course is now packaged and marketed non-profit for $375 by EEI's Industrial Electrification Council. Twenty-five utilities have bought it. This figure even includes a partial order from the French Office of Power Stations representing Electricite de France.

NYSEG, one of the first utilities to try the course, gave it first to its own power salesmen, then to its industrial customers. It declares in retrospect that the course was worth every bit of time and trouble involved.

It Paid Off . . . The course paid off handsomely in such intangibles as good will and closer, more-personal relationships between company salesmen and engineers who look after the electrical welfare of their own companies. From a materialistic point of view it helped the industrial customers effect economies and thus improve their competitive status. It enabled utility power salesmen to concentrate on "big" projects, and—as a by-product—it developed two of NYSEG's men into oft-needed public speakers.

If properly handled, this project is a credit to the sponsoring utility. Furthermore, it serves as a focal point for real coordination of utilities, manufacturers and distributors of electrical heating equipment, and potential users of industrial equipment. This is a valuable offshoot. For example: Increased distributors' sales, growing industrial load for the power company, and reduced manufacturing costs of NYSEG's customers (or improved products and services) already have been observed in the Binghamton area as results of the conference presentation.

NYSEG's Executive Vice-President A. W. Milliken attended one session and came away enthusiastic. Later management of various students commented in glowing terms to some of the utility's personnel—proving that

HERE'S HOW NYSEG's demonstration was set up. Man at right runs tests while man at left talks. They swap roles after the "break"

Rewards Utilities and Customers

the course had leaped the "theoretical barrier" and had landed solidly in cost-cutting practice.

Armed with new knowledge of electric heater installations the students returned to their offices and applied the theory to their everyday problems. Concrete results soon appeared. Some of their accomplishments follow this article.

What's in the Package . . . The packaged course includes two leader's guides; 50 textbooks for students; 120 overhead projector (Vu Graph) slides; 16 charts to aid in the presentation, a five-part sound slide-film, "Heat—Where You Want It," and 14 pieces of heating equipment and related articles for classroom demonstrations. Extra student texts cost $2 each.

The course is broken into six two-hour sessions. When students are the utility's own power salesmen, it is recommended that the course be given in six consecutive evenings. When students are the utility's industrial customers, the classroom sessions should be scheduled weekly.

The first two lessons bridge the fundamentals of electric heating. The instructor identifies strip, cartridge, immersion, fin-strip, and tubular heaters for the class. He tells students where they can use electric heat, when to use it, why to use it, how to use it, and what makes it economical.

A simple water heating problem begins in lesson-one and runs through later lessons. Instructor and students work out more and more details as they progress. This is the problem: "Here is an open hot water tank 2x3x2 ft with water 1½ ft deep. Suppose we have to heat this water from 50 to 150F in two hours. We will assume a room temperature of 70F." The instructor shows them how to figure the heat required, how to convert Btu's into kilowatt-hours, how to figure losses, and what happens if the steel tank is insulated or is vented.

Gimmicks to Use . . . When NYSEG began planning its course, it looked about for some "gimmicks" to stir the enthusiasm and interest of its prospective students. Here are some tips from

The Students Talk Back . . .

This is the questionnaire that New York State Electric & Gas Corp asked its students to fill out after completing the IEC's Metal Sheath Heater Course. Here is what the men had to say:

We would like to know if the heating conferences have been worthwhile. Please tell us what you think, either good or bad. Just check your answers:

1. I have learned:

A lot	49	96%
A little	2	4%
Nothing	0	0

2. I found homework problems:

Helpful	50	100%
Time-Consuming	5	10%
Little Value	0	0

3. If conferences were held on the following subjects, which would you attend?

Industrial Lighting	18	36%
Advanced Industrial Heating (Induction, Dielectric, Arc)	30	60%
New Applications for Electricity (Automation, Ultrasonics)	45	90%

4. How could the heating conferences have been better?

34 Favorable—No comment for improvement

16 Favorable—Comments:

More class discussion (5)
Larger room (3)
Higher stage to permit better view of demonstration (2)

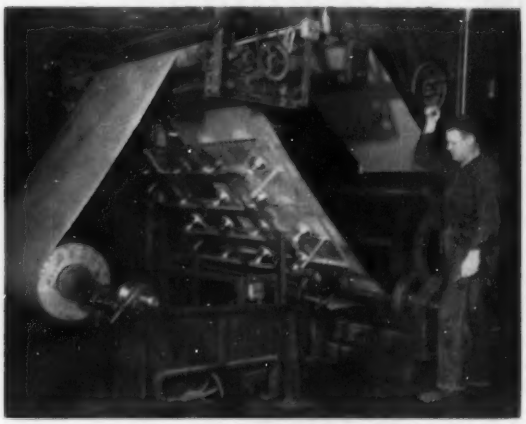
L. P. Fries, manager of power sales. You can harness them to this course, or use many of them with programs that your company may tackle in the future:

- If possible, send your instructor and his assistant to a class being conducted by a neighboring utility. This gives them a chance to see how the course is presented and provides them with a little pre-teaching experience.
- Contact top management among your customers, perhaps through your power sales department's representatives, and outline the depth and scope of the course. Suggest that men be chosen who would be benefited in their jobs or who might be considered for future advancement.
- Limit registration from each plant or company. This helps keep the training group small and emphasizes the need for proper selection of students.
- Charge $5 "tuition fee" for each student. When the student himself pays this fee, he is more apt to attend all classes. The cash outlay is concrete indication of his personal interest in the subject. Many companies reimburse their students upon successful completion of the course.
- Refer to the group meetings as "conferences" rather than "schools" or "training sessions."
- Have a few "silver dollar" questions on hand to stimulate interest and to provide a relaxing change of pace, particularly during lecture periods. A silver dollar is awarded to the student who gives a quick answer to the questions tossed out by the instructor.
- Serve coffee and doughnuts after class. This gives you and your cooperating manufacturers' representatives (who participate only as members of the conference group) a chance to get acquainted. Students often use this time to probe more deeply technical questions deferred during class.
- Divide your meeting into two 50-min sessions with a 10-min break. Ventilate the room during the break.

Prize Gimmick . . . To encourage students to do their homework assignments (which were optional), NYSEG purchased door prizes with "tuition fees" it collected. To be eligible for the drawing, the student had to submit his homework. These prizes were household electric heating appliances, and were enthusiastically received by the students.

NYSEG has found the conference so rewarding on the home front that it put the course on the road. It is being duplicated at Elmira, Lancaster, Lockport, Geneva, Auburn, and One-

Here Are Some Student Heating Installations



Infrared Heats Kraft Paper to Prevent Color Smears

Pressmen at Binghamton Container Co, Inc, continually ran into trouble when manufacturing colored bond and Kraft corrugated board. The colored paper was not dry when it hit the preheating roller. The color smeared on the roller and was streaking.

Oscar Svenson, assistant foreman in the maintenance department, solved this problem with a bank of infrared lamps on an angle-iron frame. The 16 lamps, each of 250 w, are connected in two circuits.

Mounted on casters, the frame was made tiltable so heat could be spotted where wanted. Now the color dries under the lamps before it reaches the preheating roller. Svenson devised this solution after attending some of NYSEG's heating conferences.

Immersion Heaters Solve Milk Delivery Problem

Immersion heaters installed in the cooling water systems of 13 large milk delivery trucks have increased garage space, facilitated repairs to other trucks, and helped maintain delivery schedules on cold mornings.

Nine trucks are equipped with 6.8-amp, 220-v heaters. Four have heaters rated at 11.3 amp, 220 v. Parked outdoors at night, all 13 trucks are plugged into enclosed safety switches. Each switch handles three trucks.

The trucks formerly were garaged. But the mechanic lost time "shuffling" them around. Then they were parked outdoors. But they had to be towed on cold mornings.

After taking NYSEG's heating course, Floyd Blow, electrician, Crowley's Milk Co, Binghamton, N. Y., designed this installation.

onta and has enrolled about 400 in the seven conferences. In taking the course to outlying divisions, NYSEG used a scheme similar to the plans of the Pennsylvania Power & Light Co, Allentown.

Spread-Out Company . . . PP&L, which spreads over 9,600 sq miles, is now carrying the course by station wagon to three of its six divisions. Three adjoining divisions were chosen to economize in moving the course from day to day. Demonstration and display equipment is mounted so that it can be plugged in quickly at the conference site. A single lesson is being loaded into the station wagon at a time.

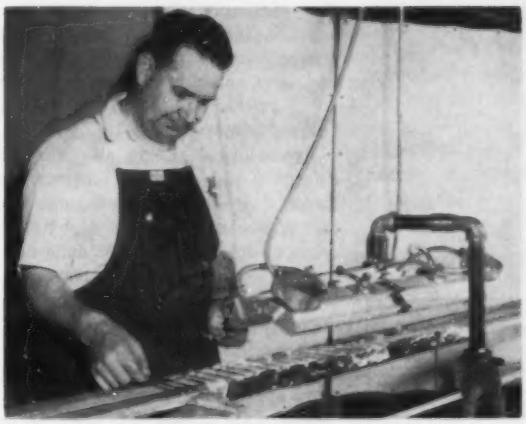
The instructor (a technical consultant from the general office) is taking the course on three successive nights to the three divisions. He will lecture while an assistant, supplied by the local division, conducts demonstrations for him. Fred Diffenderfer, manager of PP&L's Industrial Sales Dept, said the remaining three divisions of the company will get the course after it is completed in the first three divisions.

Compact Company . . . Philadelphia Electric Co, serving more than a million customers, exemplifies the utility with a heavy industrial load concentrated in one city. Because of its compactness, this company does not need to put the course on the road. In cooperation with the Electrical Association of Philadelphia, PE hired an instructor in the physics and electrical engineering department of the Drexel Institute of Technology. He already has given the course to the utility's own men.

Arnold Spillman, assistant manager of PE's Market Studies and Service Division, said the course probably will be presented more than once for industrial representatives. This is because of the large number of men who have shown great interest, and who want to take the course.

In the Future . . . The quality and effectiveness of the course seem apparent from the questionnaire NYSEG asked its students to fill out. Forty-eight of 50 said they had learned "a lot" (see box on page 83). They also expressed interest in other electrical courses that may come along in the future—courses such as advanced industrial heating, which would include induction, dielectric, and arc heating, and new applications of electricity involving such things as automation and ultrasonics.

That Dramatize the Value of the Course . . .



Radiant Heaters Double Shoe-Stay Production

Radiant heaters have doubled production of short-length stays used in bowling and high-topped shoes by a Binghamton shoe manufacturer. Farrell's Machine & Tool Corp, which contracted for the stays, sought out a quick-drying enamel to cover sharp metal edges that might eventually cut the leather.

But even the quick-drying enamel was not fast enough. Foreman John Frisbie, who took NYSEG's course, then suspended two 800-w radiant heaters over the slow-moving belt upon which stays were dried.

He tacked alumnium foil beneath the heaters to reflect warmth to the undersides of the stays. Now the enamel is completely dry when stays drop into the box at the end of the conveyor belt.

14.4 Kw Melts Snow, Ends Winter Worries

Workmen already were ripping up E. H. Titchener & Co's old sidewalk when someone suggested that heating cable be put into the new one to make it safer on snowy days. Situated in a busy part of town, the old sidewalk had been a constant worry during the winter.

Jack Darling, maintenance foreman, learned what heat-cable was available locally. He was racing against time. A fast construction schedule had been set up. Holidays were pressing construction, and freezing weather had been predicted. The concrete had to be poured promptly. It was, but buried in the 225-sq ft area were 14.4 kw of heating wire. The cables were wire-stapled about an inch below the sidewalk top on 2-in. centers. The wire runs about 5 w per ft.

New Test Rates Engineers' Ability

MARVIN D. DUNNETTE, Assistant Professor, Industrial Relations Center, University of Minnesota

The need is urgent to learn more efficient methods of utilizing the limited supply of engineers presently available. Putting engineers on jobs where they may be the most productive will not only ease present shortages of engineers, it will also contribute to increased satisfaction and achievement for tens of thousands of engineers who may now be doing jobs that call for less than their full skills or for skills they do not possess.

At one time, it was widely held that "an engineer was an engineer." But today, it takes no person of outstanding insight to recognize that an engineer's duties cover a myriad of activities. His functions include pure and developmental research, technical selling, managing and administration, and production and operations—to name but a few. Several one-time engineers are employed in topflight executive positions for which engineering training is an aid but not a necessity. Many crucial questions come to mind:

- How do engineers performing different functions differ?
- How can these differences be identified and measured?
- Which differences are most important in determining success or failure on a job?
- Can such differences be reliably measured. If so, can these measures be used to predict where a given individual will do the best job?

Answers to these questions must be determined through personnel research. Once they have been discovered, more efficient utilization of engineering manpower will be the direct result.

Although complete answers to the above questions are not available, industrial and personnel psychologists have given us important leads on where to look. For example, they have discovered the areas that appear to offer the most fruitful approach for the personnel evaluation of engineers. These include the measurement of engineering knowledge or aptitude, the measurement of vocational interests, and the evaluation of personality. Each of these is singularly important to success in an engineering job.

One of the great principles of industrial psychology is that ability, interest, and personality must interact to produce success on a job. High ability—a lot of knowledge—is rarely sufficient in itself. It must be coupled with a real desire to do the job—a basic interest in the kind of work that the job entails.

Personality Is a Factor . . . One job may require an impulsive, highly active individual. Another job may demand a quiet, retiring, methodical thinker. Psychologists have made great advances in their efforts to relate different abilities, interests, and personalities to success and persistence on different jobs. Unfortunately, very little research has been directed toward evaluation of high ability engineers. It might be fair to state that psychology has provided us with a research approach, but existing knowledge still does not provide answers to the questions stated earlier.

With respect to ability measurements, one big difficulty has been that engineers, by and large, are superior individuals. Many existing psychological tests are too easy for engineers, and important ability differences at this high level are not accurately measured.

Psychological testing also has received a bad name in engineering ranks. Part of this stems from the fact that many tests consist of rather esoteric problems which lie quite outside the experience of most engineers. While such tests might be sensitive measures of intelligence, an engineer can't see what relationship they have to engineering. What was needed was a test of engineering knowledge which looked like a test of engineering knowledge.

New Test Is Developed . . . Recognition of this need has led to development of the Minnesota Engineering Analogies Test (MEAT). This test is the result of an effort to combine features of an abstract reasoning test with those of a comprehensive engineering achievement test. It is an attempt to build an engineering ability test which will accurately identify high level engineering ability and which will be acceptable to the engineers who take it. Preliminary research suggests that this effort has met with substantial success.

For example, engineers doing dif-

Minnesota Engineering Analogies Test consists of problems of the four-alternative multiple choice variety in analogy form. Examples of some of the problems in the test include the following:*

1. **Add : Subtract : : multiply : a. integrate, b. *divide*, c. magnify, d. differentiate.**
2. **In a triode,**
   Spectators : turnstile : : plate current : a. cathode, b. plate, c. anode, d. *grid*.
3. **Rate of fluid flow : electric current : : pipe friction : a. electromotive potential, b. *electrical resistance*, c. electrical conductance, d. resistivity**

In order to answer any one problem correctly, an engineer must know not only his subject matter but also must be able to perceive and identify the appropriate relationships. Psychologists have known for a long time that this ability to perceive relationships is related in a subtle way to general intelligence and abstract reasoning ability. It is likely, therefore, that Minnesota Engineering Analogies Test is an effective measure not only of what an engineer knows but also of how well he can use the facts he does know. Development of MEAT has been carried on over a span of three years during which over 1,300 engineering students and employed engineers have taken the test.

* The correct answers are italicized.

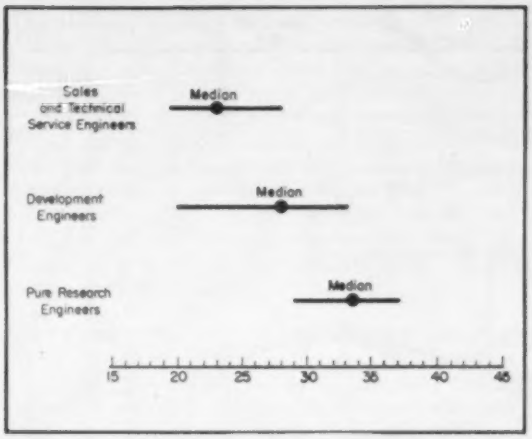


CHART I shows how engineers with different types of engineering duties score differently on MEAT, giving valuable clues for placement

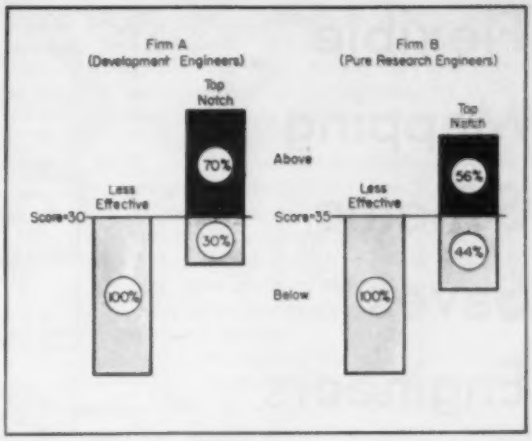


CHART II shows relationship of scores to engineering effectiveness as judged by supervisors of the engineers who have taken MEAT test

ferent types of engineering duties characteristically score differently on MEAT. This is an important finding because it shows that scores on this test may give some clues about where a young engineer might do the best job. Chart 1 shows how this works.

Information Provides Guidance Values . . . This chart shows the middle 50% of scores for three groups of engineers engaged in different engineering duties. A quick glance shows that pure research engineers score highest followed in decreasing order by development engineers and sales and technical service engineers. This information can be useful in the guidance of a young engineering applicant.

It is important to remember once again that knowledge is only one of the important factors that contribute to engineering achievement. The important areas of interest and personality should never be neglected.

Another example of the usefulness of MEAT is shown in Chart II. This shows how scores on this test are related to engineering effectiveness as judged by supervisors of the engineers who have taken the test.

Supervisors were asked to rank the engineers under them in terms of overall engineering effectiveness. Chart II shows how well scores on MEAT discriminate between these "top notch" (top quarter) engineers and the "less effective" (bottom quarter) engineers. Experience with the test shows that its content is acceptable to most engineers who take it.

The development of Minnesota Engineering Analogies Test is an important step toward supplying answers to the questions outlined earlier in this article. However, this development has concentrated on the measurement of knowledge or aptitude. As stated earlier, vocational interests also are important in a consideration of engineering achievement.

Preliminary research with the Strong Vocational Interest Inventory test shows that measurement of interest also may help predict future engineering effectiveness. One study shows that research engineers characteristically obtain markedly different scores from those of sales engineers. Top research engineers showed interests similar to those of physicists, chemists, and mathematicians. Top sales engineers were more similar to sales managers or real estate salesmen. Most significantly, those research engineers rated as most effective by their superiors were those who scored highest on the basic science occupations.

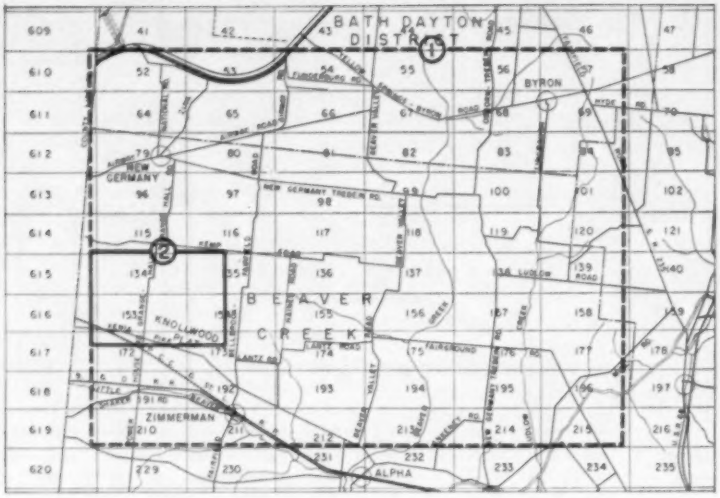
Interests Are Important . . . These findings with the Strong Vocational Interest Inventory are of special significance. They show that an engineer's interests (quite apart from ability) may be important in determining where he will do the best job and how good a job he will do. Research is now being directed toward determination of the characteristic patterns of interest shown by engineers performing different industrial duties, such as pure research, production, sales, administration, etc. It is hoped that when these data have been collected and analyzed, valuable information will be available which will greatly increase the precision and accuracy of occupational placement of graduating engineers and engineering applicants.

Finally, what of the personality factor in engineering achievement? This is the toughest problem of all. It is made especially difficult because personality interacts inconsistently with knowledge and interest to produce high or low achievement. An impulsive, dynamic personality may be just the one that is needed to compliment mediocre knowledge. But, such a personality could be a definite detriment to a person who has low engineering aptitude or knowledge.

More Research on Tests Required . . . So far personnel research has only scratched the surface in terms of accurately measuring the personality factor. Several tests and inventories exist which purport to measure different aspects of personality, but validation of these tests against actual job achievement has not been attempted.

Most promise for more efficient utilization of engineers lies in expanded use of a high level ability test such as Minnesota Engineering Analogies Test. This must, of course, be supplemented by research on the vocational interests of engineers and studies of different personality measures. It is likely that industrial decisions concerning the utilization of technical and engineering manpower will be significantly eased as more and more facts accumulate in this important area of personnel research.

Flexible Mapping Scheme Saves Engineers' Time

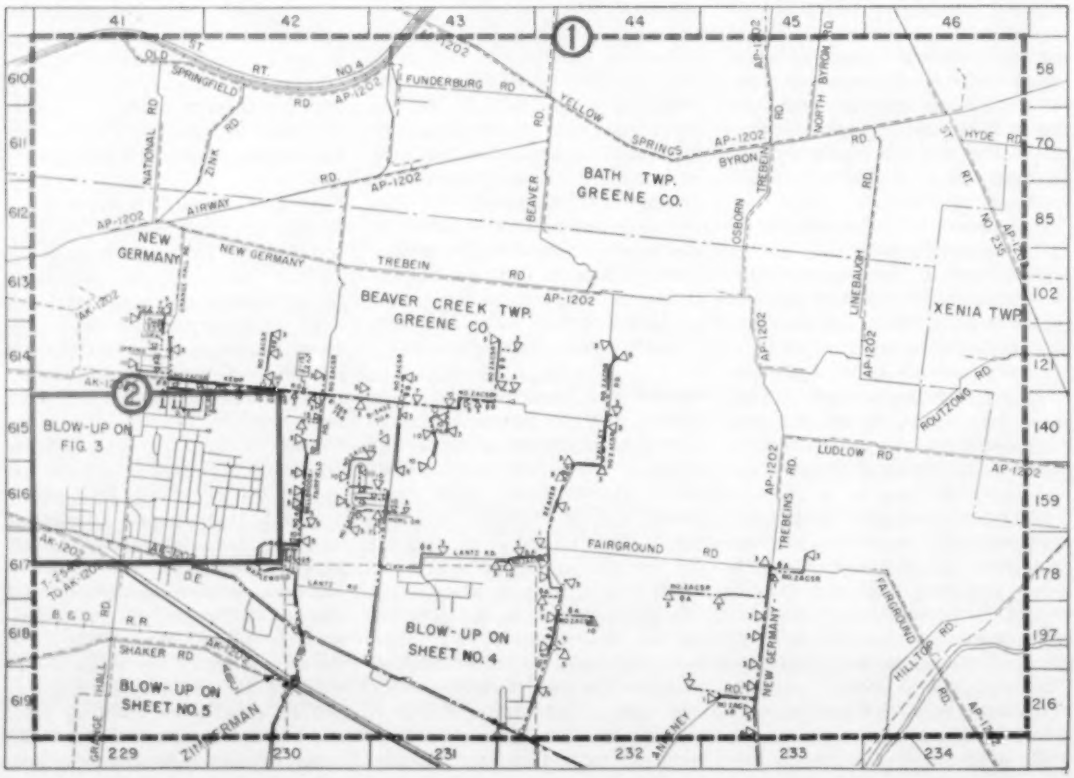


IVAN C. EPPLEY, Chief Electrical Engineer, Dayton Power & Light Co, Dayton, Ohio

Streamlining Dayton Power & Light Co's mapping procedure has simplified the job of keeping maps up to date as a result of rapid distribution system changes. Moreover, the scheme saves time of engineers and draftsmen.

Planning engineers can obtain any combination of master maps all matched into one complete map, if desired, at practically no expense of engineering time. The same is true for engineers designing line extensions and revisions to the distribution system, which serves urban, suburban, and rural areas in 24 counties.

Index map (above) guides drawing of master backgrounds for grids, which are reproduced



To develop the line of maps the company started with U. S. Geodetic Survey maps and other reliable material, such as city and plat maps. From these a set of index maps were drawn to the scale of 1 in. per mile.

On the index maps a grid was laid out, which is continuous and matching throughout the company's service area. Each unit of the grid was then enlarged, by means of a pantograph, to a scale of 2,000 ft per in., on 18 x 24-in. tracing cloth. Roads, principal streets, railroads, township, and county boundaries are shown in ink. These tracings are the master backgrounds and are only used to make reproductions.

Make Changes Easily . . . Reproductions of background maps are made on the back of diazo-intermediate plastic-coated cloth. This leaves the face of the cloth free for distribution lines and associated information. Thus, frequent changes of electrical circuits can be made without disturbing the more permanent background material on the reverse side.

If a change is necessary on the back, the dye coating can be scraped off or erased and corrections made in ink. The sensitized cloth reproduces a sepia line. This prints well and yet shows up in good contrast with the feeder information which is in ink on the face of the cloth. Reproductions and prints are made on a dry developer type machine.

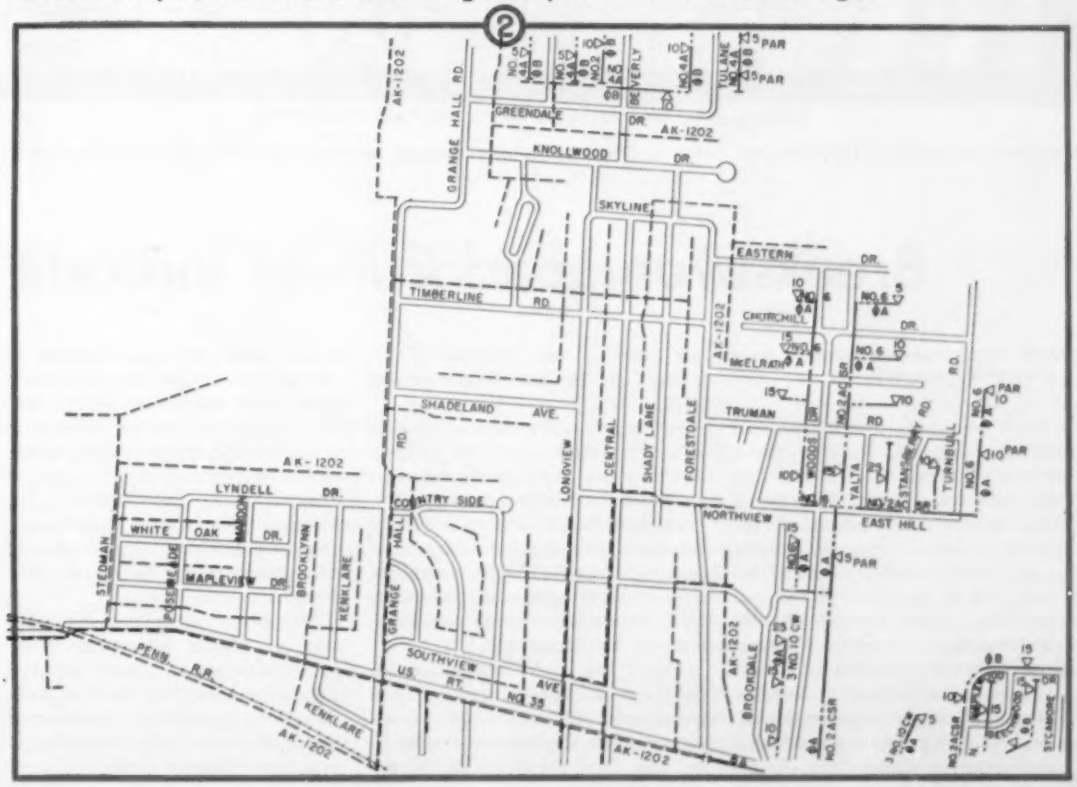
For mapping each distribution feeder, reproductions of all background grids in the feeder area are used. The specific feeder is shown in heavy ink. Adjacent feeders lying in the same grid are added with penciled dashed lines and with less detail. When areas are transferred from one feeder to another, drafting changes are minimized. In congested areas, such as city or suburbs, the 2,000-ft-per-in. grids are enlarged to 500 ft per in.

Meet all Needs . . . Greatest use of distribution feeder maps is by operating personnel. The system planning engineer needs for his studies a background which usually covers a large geographic area with the present distribution feeders in place. He wants it in the form of a tracing so that he can show proposed changes or extensions. He usually wants to show a number of alternate plans and wants several prints of each plan.

To meet his requirements black and white prints of the area are studied, cut, matched, and pasted together. This can be done by a clerk. A photographic transparency made of the assembly is reduced one-half to 4,000 ft per in. The transparency is a positive, black line on white, with the lines appearing on the back of the paper. With the lines on the back a sharper print can be made. Then the planning engineer can place the proposed layout on the front, where it can be altered without disturbing the background.

In addition to conserving the time of planning engineers, distribution engineers can take advantage of these same processes to obtain backgrounds for use in their work. Master background tracings can supply an unlimited number of reproduced tracings and yet are not worn out by frequent corrections and handling.

for feeder maps (lower left) and for congested portions thereof (lower right)



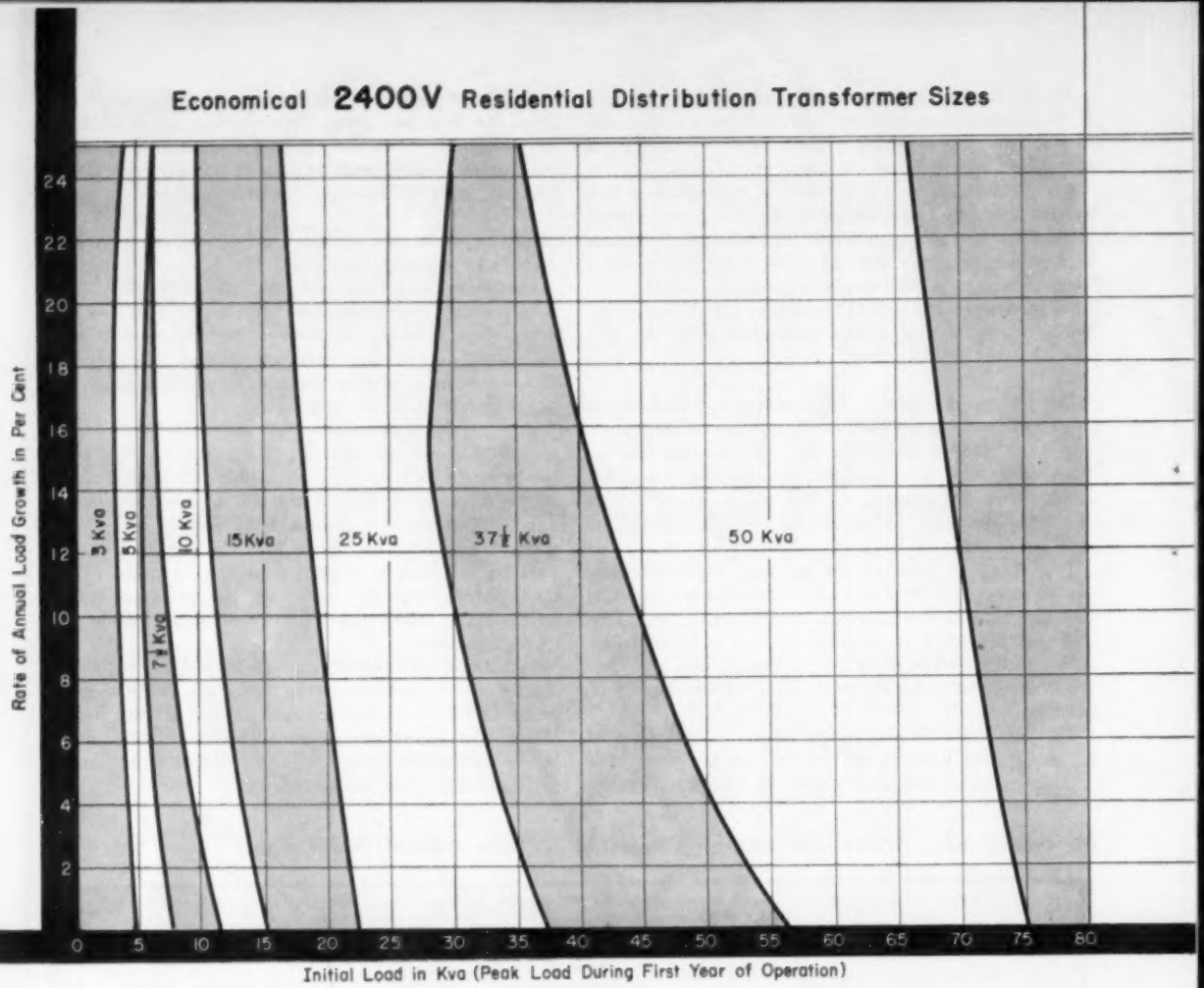

Economical 2400V Residential Distribution Transformer Sizes
Rate of Annual Load Growth in Per Cent
3 Kva
5 Kva
7½ Kva
10 Kva
15Kva
25 Kva
37½ Kva
50 Kva
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80
2 4 6 8 10 12 14 16 18 20 22 24
Initial Load in Kva (Peak Load During First Year of Operation)

FIG 1—ECONOMICAL INITIAL SIZES for 2,400-v residential distribution transformers depend on initial loads and rate of load growth.

Break-Even Load Curves Indicate

ZANE TODD, Engineer, Indianapolis Power & Light Co, Indianapolis, Ind.

Break-even load curves today afford Indianapolis Power & Light Co a practical method of selecting the economical transformer size for a given location. The method is applicable wherever variations in transformer annual charges, other expenses, and the maximum rate of load growth are within expectable limits.

Determining economical transformer size for a location involves a loss comparison of larger and smaller unit sizes within the range considered. Compared with a smaller one, a larger transformer has higher fixed charges and exciting losses but lower load losses. Costs then tend to favor smaller sizes.

But a larger transformer remains in service longer. This postponement of charge-out costs has a compensating effect on the higher annual outlay. Postponed charge-out costs introduce present worth into the comparative economics, and allowable maximum transformer loading, as determined by local service and climate conditions, must be considered also.

Figs 1 and 2 give economical initial loads at various rates of load growth of 2,400 and 7,620-v transformers for single-phase residential service. They are based on present annual costs and other expenses of various units. The curves indicate initial loads required at various rates of load growth for the costs of a smaller transformer, including replacement expenses, to equal the costs of the next larger size. The area between two curves represents the economical initial loads at corresponding rates of load growth for a given transformer size.

The charts apply only to initial loads on new or replacement transformer installations. Charge-out loadings are not shown. Once a transformer is installed, it is the most economical size until it reaches its maximum allowable loading.

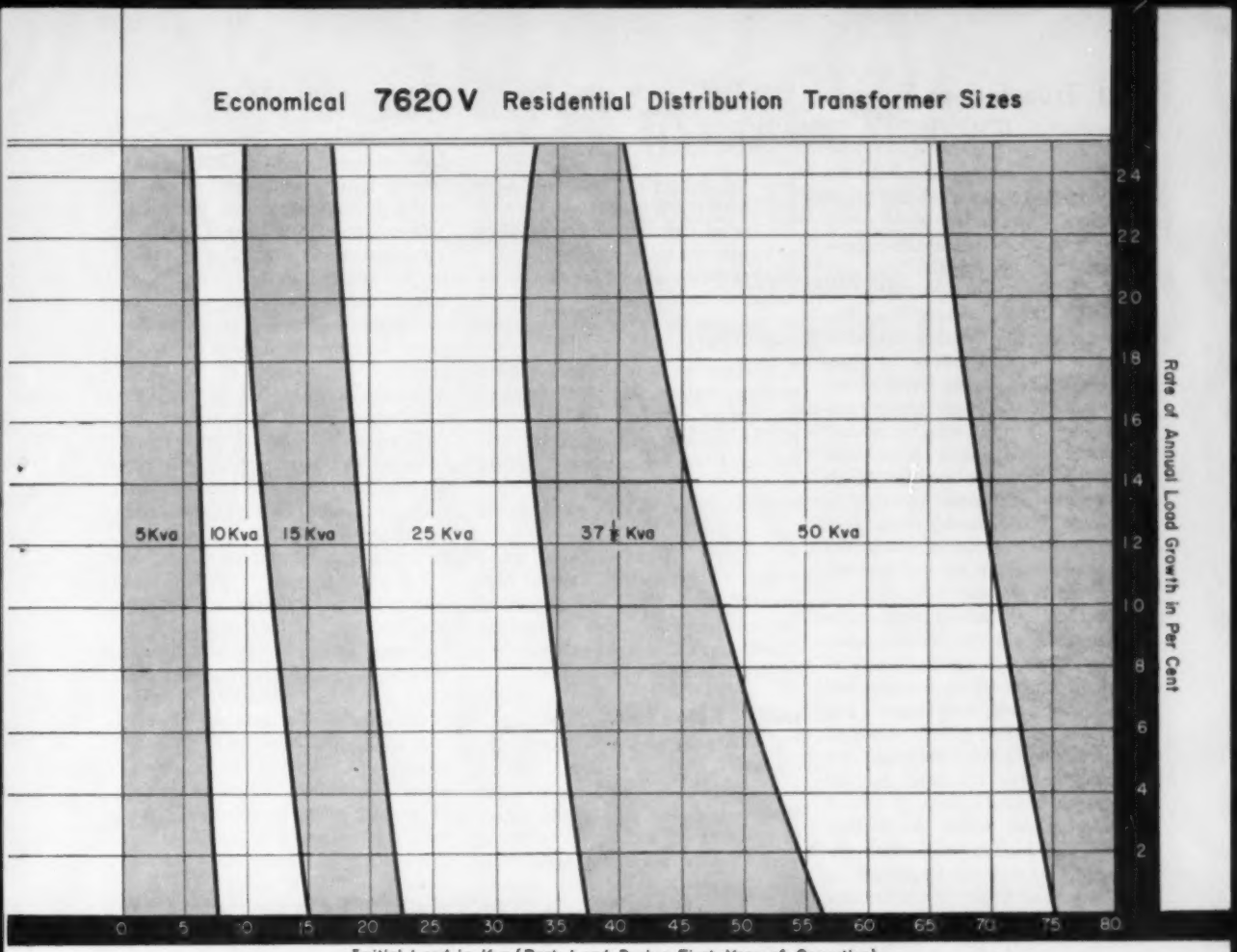


FIG 2—BEST TRANSFORMER SIZES for 7,620-v distribution can be picked from curves based on fixed charges, replacement costs, and losses

Economical Transformer Sizes

Maximum Allowable Load . . . Allowable maximum winter load on a distribution transformer, according to company practice, is 150% of rating. Winter loads are predicted from loads at other times by applying the seasonal multipliers in Fig 3. When application of these multipliers shows that winter load will be 150% or more of rating, the transformer should be replaced as soon as practicable because it is approaching its thermal limit at prevailing ambient.

The allowable maximum load of 150% of rating is based on data from a continuous load study by the engineering department and other sources showing:

1. Winter loading of 150% makes maximum use of thermal capacity.
2. Loading above 150% causes excessive transformer voltage drops.

The 150% allowable winter loading is applicable in nearly all cases. The present average summer thermal limit of a distribution transformer is 135% of rating. Summer loads average about 70% of winter loads. A transformer loaded to 150% in winter normally would be loaded to only 105% during the preceding summer.

In a few areas a high density of room coolers, air conditioning, and similar summer loads reduce summer capability of transformers by raising their load factor. In such cases summer peak approaches winter peak, and allowable winter load is less than 150%. Should these areas become numerous enough, another study will be necessary to revise the allowable loading figure, seasonal multipliers, and the charts of economical initial loads. At any rate, these factors are different on different systems.

Derivation of Curves . . . The curves of break-even initial loads were derived from two sets of equations. One set describes the relationships at low rates of load growth. When a transformer becomes overloaded at these

(*Continued on page* 92)

Best Transformer Sizes

—Continued

rates, it is normally replaced by the next larger size. Half of one equation sums up the present worth of annual charges for a smaller transformer at a given initial load and rate of load growth, until it is replaced by the next larger size. The present worth of change-out cost is included. The other half of the equation summarizes present worth of annual costs of the larger transformer when initially installed. A second equation relates initial load, load growth, and change-out loading of the smaller transformer.

At high rates of load growth, some transformers are replaced, not by the next larger size but by the size still larger, three successive sizes being involved and a second set of equations needed. One side of one equation summarizes present worth of costs involved in using the smaller size and replacing it with the larger. The other side describes present worth of costs from using the middle size and replacing it with the larger for the same period of load growth. A second equation relates initial load, load growth, and change-out loading for the smaller unit. A third equation relates these quantities for the middle-size transformer.

Thus for any given transformer size, the break-even point of intial loading, between it and the size below and between it and the size above, can be determined for any rate of load growth. The initial loads between these limits will then be the economical initial loads for the given transformer.

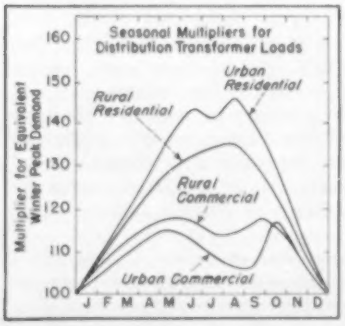


FIG 3—PERCENT MULTIPLIERS for equivalent winter peak demands, determined from customer kwhr use per month, adjust test readings, made any time, to peak load period

Data Used . . . In calculations pertaining to 2,400-v and 7,620-v transformers the following data were used:

1. Fixed charges were estimated to be 15.5% of capitalized costs.

2. Cost of transformer energy losses was estimated to be 5 mills.

3. Loss factor of load losses was estimated to be 15%.

4. The loss factor of exciting losses was 100%.

5. Change-out loading for distribution transformers was 150% of nominal rating.

6. Transformer load test costs were estimated at approximately $5 per test.

7. Present worth was based upon 6% rate of return.

8. Diversity factors from transformer load losses to system components were: 1.7 to generation, transmission lines, and transmission substations; 1.4 to subtransmission; 1.3 to substations and primary lines.

Data for 2,400-v Units . . . Data applying specifically to 2,400-v transformers are:

1. Capital costs of 2,400-v transformers included the installed costs of transformers and accessory equipment directly associated with them. The total costs ranged from $124.53 for a 3-kva to $550.38 for a 50-kva transformer.

2. Demand charges for transformer losses were based upon the existing investment per kw of normal capacity for all system components down to the high-side of the transformers, and 15.5% fixed charges. The total investment was $220.89 per kw. The demand charge for exciting losses was $34.24 per kw. Application of diversity factors reduced the demand charge for load losses to $31.64 per kw.

3. Change-out expenses for 2,400-v transformers were computed as the cost to remove the old transformer and install a new one. Average cost, including $5 for a load test, was $31.22. This cost corresponds closely to the cost per installation if a line crew could replace six transformers a day.

Data for 7,620-v Units . . . Data applying specifically to 7,620-v transformers are:

1. Capitalized costs for 7,620-v transformers included the installed costs of the transformers and their accessories. They ranged from $200.28 for a 5-kva to $692.30 for a 50-kva transformer.

2. Demand charges were based upon investment per kw of normal capacity for all system components down to the high voltage side of the transformers and 15.5% fixed charges. Total investment was $189.79. Thus the demand charge for exciting losses was $29.42 per kw. Application of the diversity factors reduced the demand charge for load losses to $18.44 per kw.

3. Change-out expenses for 7,620-v transformers were computed in the same manner as for 2,400-v transformers. The average cost, including $5 per load test, was $35.47. This cost corresponds closely to the cost per installation if a line crew could replace five transformers a day.

Interpretation of Results . . . The charts indicate marked differences in the ranges of economical initial loads between small and large transformers. These differences are most noticeable at the usual rates of load growth, 8% and above. At these rates of load growth, the initial loads of transformers through 10 kva should usually be somewhat less than 100% of rating. This corresponds closely to the past practice of initially loading transformers at 80% of rating. The economical initial loads of medium size transformers, through 37½ kva, are about equally distributed above and below 100% of rating. The range of economical initial loads for 50-kva transformers lies predominantly above 100% of rating.

Positions of the curves on the charts remain relatively unchanged by reasonable variations in transformer annual charges and expenses. Changes in demand charges have negligible effect. A 20% decrease in cost of losses shifts the curves about 2% to the right at 25% load growth. Variations in change-out costs have about the same magnitude of effect. If a line crew could replace only five, instead of six, 2,400-v transformers in a day, the change-out cost would be increased by 12%. The curves of Fig 1 would be shifted then about 3% to the left at 25% load growth. If a line crew could replace only four, instead of five, 7,620-v transformers in a day, the change-out cost would be increased by 16%. Such a change would shift the curves of Fig 2 about 2% to the left at 25% load growth.

(*Continued on page* 183)

Transmission Structure Design Conserves R-O-W

Two 115-kv single-pole wishbone lines are tied together with X brace for strength

PAUL R. HEIM, Electrical Engineer, Northern States Power Co, Minneapolis, Minnesota

Special transmission structure designs have been developed in anticipation of a new large block of industrial power which called for additional transmission capacity. With two 50-kv transmission lines on a 50-ft right-of-way plans for the new load called for building 2½ miles of two 115-kv lines on the same right-of-way while maintaining in service an operable 50-kv circuit during the construction period.

The result was parallel-circuit wishbone construction. It consists of two 115-kv, single-pole, wishbone lines spaced

For design details turn page

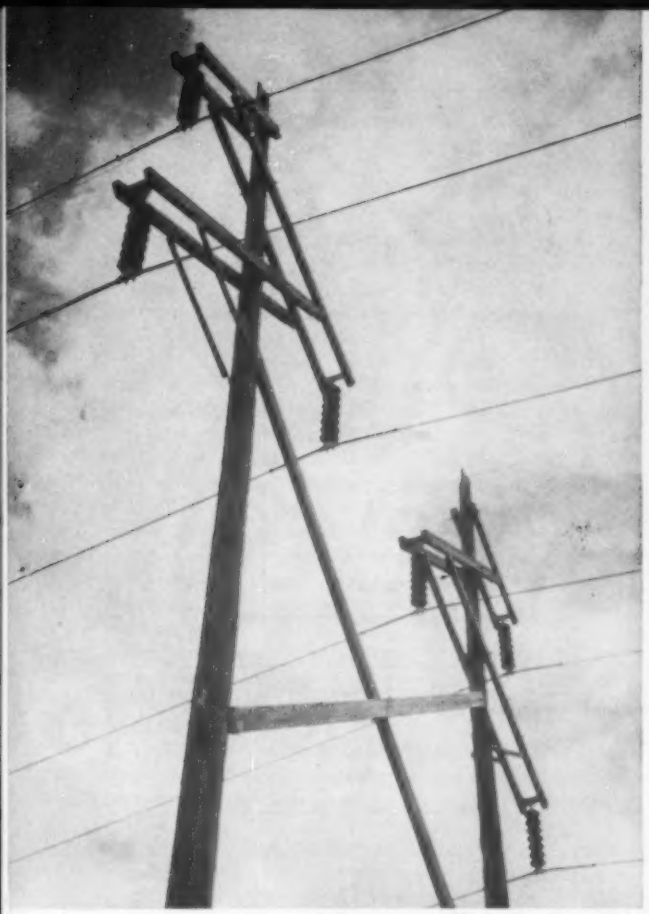
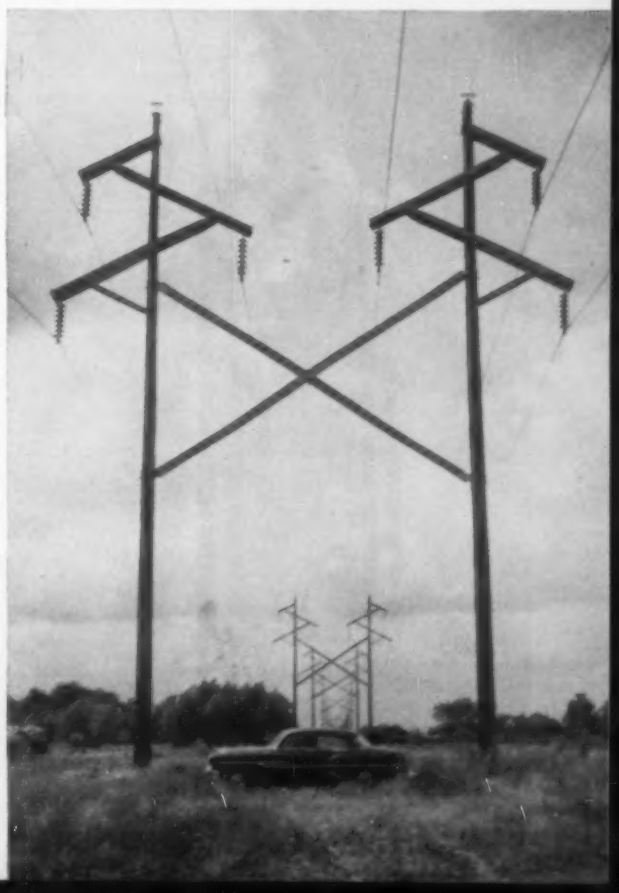


Fig. 1 PARALLEL CIRCUIT wishbone construction ties two single-pole 115-kv lines together with special X-brace. Design details of this structure are shown in Figures 6 to 9 on the following pages

Line and Structure Statistics

Voltage	115 kv
Length	3.25 miles
Conductors	477 MCM, ACSR 26/7
Breaking strength	19,430 lb
Design tension	5,500 lb
Armor rods	Tapered
Shield Wires	⅜-in., UG, 7-Strand
Sagged	Sagged at 80% of conductor sag at 60F final
Armor Rods	Preformed Steel
Average Span	456 ft
Longest Normal Span	715 ft
Longest Span	775 ft
Suspension Insulators	Tangent 7 (5¾ in. by 10 in.) Dead End 8 (5¾ in. by 10 in.)
Grounding	Minimum 20 ft of ½-in. Copperweld rod at each pole

Fig. 2 POLES ARE SPACED 28 ft apart on one 50 ft right-of-way



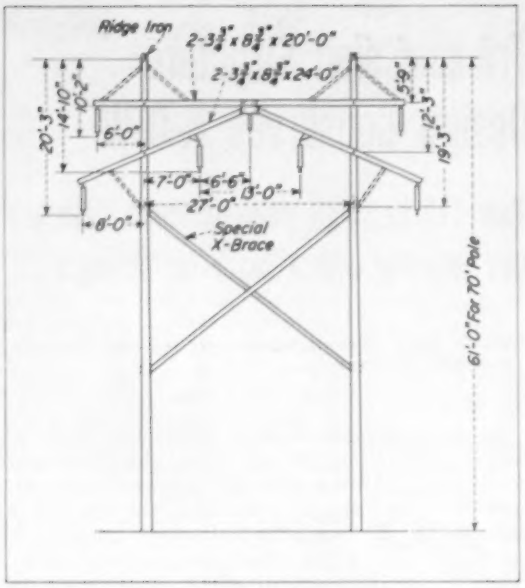


Fig. 3 NOT BUILT was the unorthodox K-Frame construction designed so that the paired structures would frame together as shown

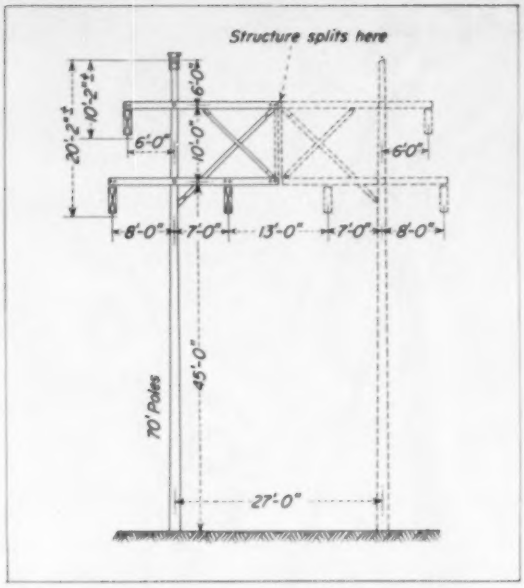
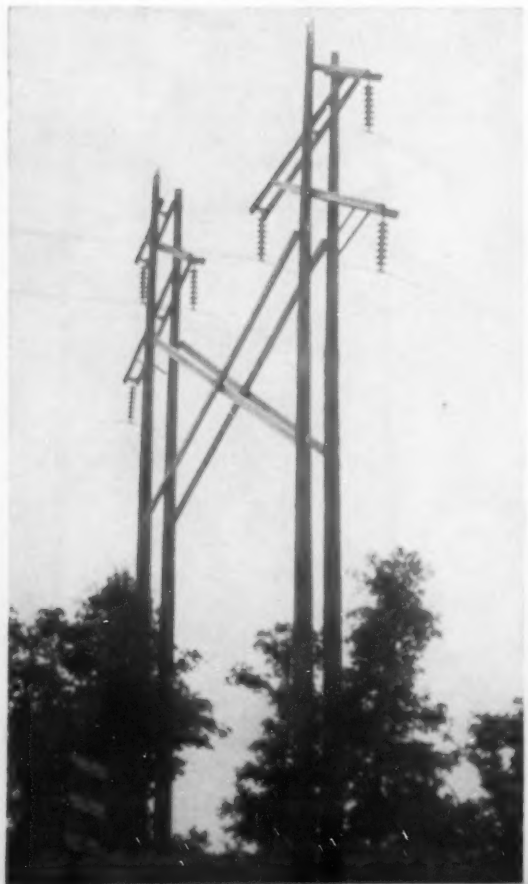


Fig. 4 REJECTED was another unorthodox design of double-circuit H-Frame construction which also paired two individual lines

Fig. 5 FOUR POLES were used in the light angle or heavy tangent structures with two of the poles topped about a foot shorter than the other two poles and with shield wires attached only to the taller poles. Span to right is 775 ft and there is a railroad crossing to the left.



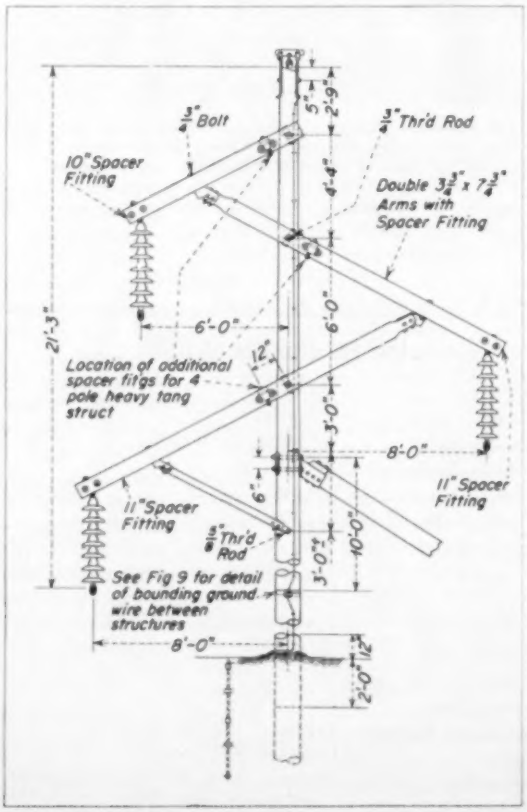


Fig. 6 TANGENT STRUCTURES offer some unique design features. Each of the eight arm or brace members can be individually replaced

Structure Design Conserves R-O-W

(Continued)

28 ft apart and tied together with a special X-brace, design No. 4 of listings that follow. After a study of several alternatives, this design was chosen because the structure provided adequate strength, required no special hardware, and would simplify construction procedures. An absolute cost analysis was not made.

Study Four Designs . . . The existing two 50-kv lines consisted of a steel tower line and a wooden "H" frame line, each centering ten feet within right-of-way limits.

The four designs studied were:

1. A double-circuit steel tower line. This was immediately ruled out because of the time required to obtain towers and of conflict with the 50-kv line to be maintained in service during the construction period.

2. A double H-frame line. This was ruled out because the conflict would require a considerable amount of 50-kv hot line work.

3. An unorthodox H or K frame which would be contructed as two individual lines but designed so that the paired structures would frame together into a unique double circuit structure.

4. Two single-pole lines, each replacing a 50-kv line. Upon completion of the second line the two lines were to be stabilized and strengthened by tying paired structures together.

Designs No. 3 and 4 were carried out for comparative purposes. Under No. 3, satisfactory K frames and H frames were developed by Northern States engineers in cooperation with Hughes Brothers engineers.

Although no absolute cost analysis was made, the per structure cost of the H or K frame lines of Design No. 3 would have been greater than the per structure cost of Design No. 4. However, with the H or K frames it was planned to use higher conductor tensions so that either shorter poles or longer spans could have been used.

Design Selected . . . The basic structure of Design No. 4, Figs 1 and 2, consisted of 70-ft, class two Western red cedar poles with two sets of 3¼-in. by 8¾-in. double wishbone arm assemblies. It can be seen in Fig 2 that the "X" brace does not cross at 90 deg. It consists of two 3¼ in. by 9¾ in. by 32 ft timbers together with hardware for the pole spacing of 28 ft.

Ground wires were brought down each pole to driven ground rods and were bonded together approximately 5 ft below the low conductor. The bonding was made here so that the lineman would not be required to work above energized conductors and to avoid the possibility of a broken bonding wire falling into the conductors.

A light angle or heavy tangent structure with the arms inside the poles is shown in Fig 5. In the application shown a pair of these structures was used for a 775 ft span. Wishbone structure details are shown in Figs 6 to 9.

A tabulation of line and structure statistics is given in the table on page 93.

Close cooperation was required between the construction and system operations departments so that construction always had a line out of service and operations always had a line in service.

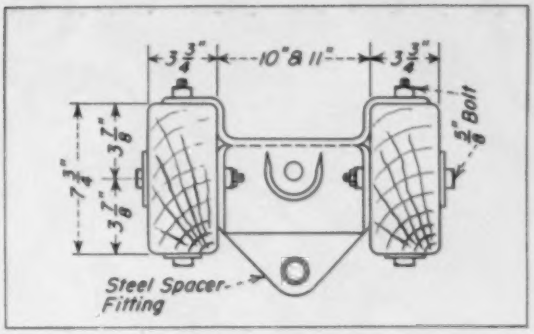


Fig. 7 ARMS ON THE light or heavy tangent structures are framed together with steel spacer fittings which also support insulator strings

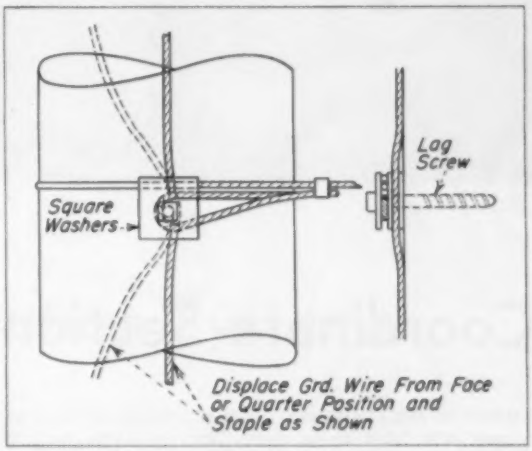


Fig. 8 BONDING GROUND wires between structures is done below the lowest phase conductor in this manner

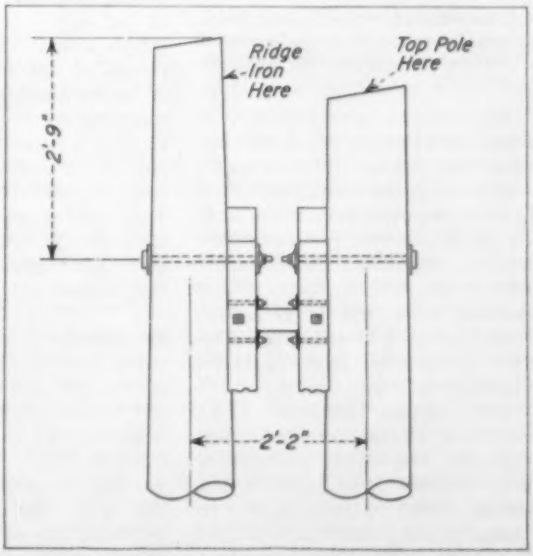
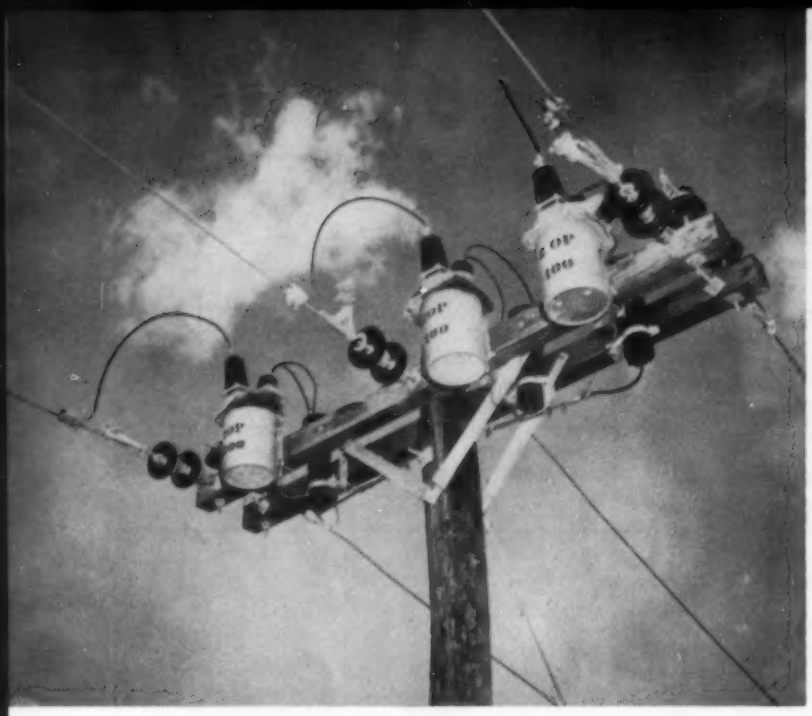


Fig. 9 SPECIAL DESIGN details were developed for light angle or heavy tangent structures



Utilities widely separated geographically use 15-kv, oil-filled units with feeder breakers and reclosers in protective combination to improve service reliability

Coordinate Sectionalizers with Station

AUBREY A. MOLLENHAUER, relay engineer, City Public Service Board, San Antonio, Texas

DONALD PURDY, Distribution Engineer, New York State Electric & Gas Corp, Binghamton, N. Y.

R. J. LAWRENCE, Product Engineer, Switchgear Distribution Apparatus Department, Westinghouse Electric Corp, East Pittsburgh, Pa.

Sectionalizers, commonly used in conjunction with oil circuit reclosers, have been coordinated successfully with station feeder breakers by utilities in widely separated parts of the country. While the basic protection problems of both utilities are similar, the City Public Service Board of San Antonio, Texas, and the New York State Electric & Gas Corp each applied sectionalizers according to the exigencies of its own system.

Both utilities employed 15-kv, single-pole sectionalizers with series trip coils. Magnetically corrected oil pump counters count pulses of fault current created by operation of a reclosing circuit breaker or a recloser on the source side of the sectionalizer. Each sectionalizer may be adjusted to count one, two, or three operations of the preceding interrupting device, after which it trips open during the next current interruption. The oil-filled sectionalizers applied by the two utilities have safe loadbreak ratings of 225 amp.

It is difficult to obtain good field records of sectionalizer performance in forcing multiple operations of the associated breaker or recloser in the event of a temporary fault. But records of permanent fault sectionalizing have been collected by both utilities. These records indicate that sectionalizers have definite merits and economic advantages when used with station breakers and reclosers.

San Antonio Conversion . . . The Texas utility, in 1952, faced the conversion of it's 4-kv distribution system and it's 13.8-kv delta sub-transmission system to 13.8 kv grounded wye. A favorable factor in this conversion was the concentration of most of the load in the San Antonio metropolitan area. All 4-kv distribution was served from major bulk stations and distribution substations, the latter fed by loop and radial 13.8-kv delta feeders. The major load was served at 4 kv wye with circuit loading of approximately 1,800 kva.

Converted circuits, the utility decided, should each carry approximately 5,000 kva which constiuted a load increase of about 275% over what the 4-kv circuits carried. High 3-phase fault currents and establishment of grounded neutral at bulk substations posed problems in planning the conversion. The scarcity of automatic sectionalizing or protection, except for the main substation breaker, prompted the utility's decision that 4-kv circuits converted to 13.8 be properly and selectively protected. The two protection schemes analyzed for their merits and disadvantages were:

1. Coordination of substation breakers, pole-mounted reclosers, and fuses.

2. Coordination of substation breakers, pole-mounted reclosers, and sectionalizers.

Fuses vs Sectionalizers . . . Evaluation of fuses used with reclosers and

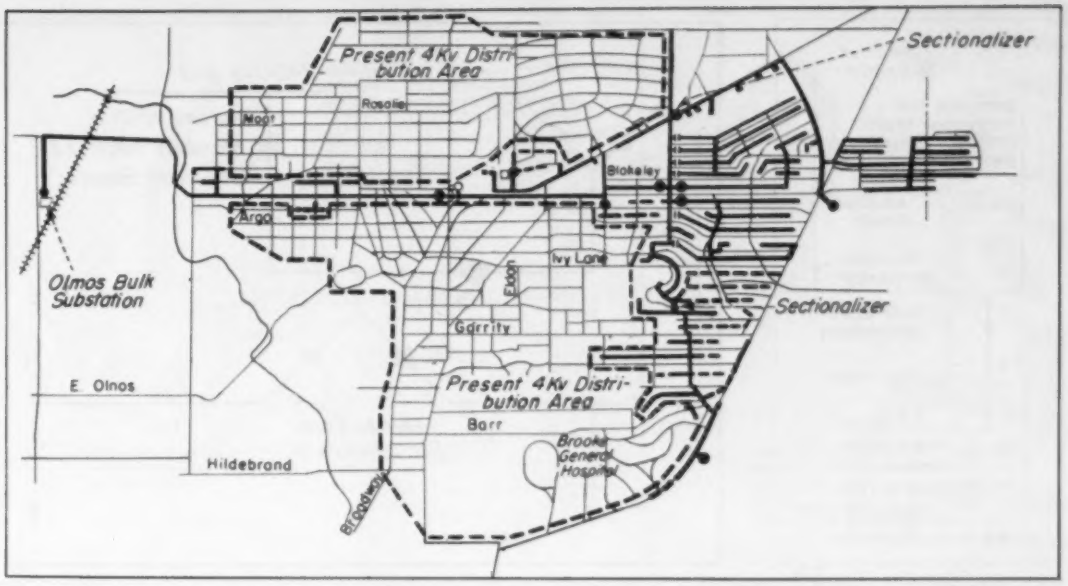


FIG 1—MAP OF TERRELL HILLS shows typical 13.8-kv distribution circuit employing dispatcher-controlled breaker and sectionalizers on San Antonio system. Fringe areas along the main 13.8-kv circuit are to be converted from 4 to 13.8-kv and fed through the sectionalizers

Breakers on Distribution Systems

station feeder breakers was based on the following factors:

1. Cost per sectionalizing point.

2. Problems of fuse coordination, selection of correct cutout ratings, revamping substation relay schemes for selective fuse coordination, and need for line and lateral reactors.

3. Problems of fault-current observation and fault isolation, including a large stock of various fuse sizes required and the danger of incorrect fuse replacement.

For sectionalizers used with reclosers and station feeder breakers, the Texas utility considered the following factors:

1. Coordination with reclosers and substation breakers. Absence of sectionalizer time-current characteristic simplifies coordination problems, replacement of fuse links is unnecessary and the only reclosing required is a hook stick operation, and laterals can be grouped and sectionalized through a junction point.

2. Versatility of sectionalizers. Momentary ratings are available to meet system requirements; several sizes are available with adjustable trip out settings; loadbreak rating allows manual disconnection for sectionalizing lines; and the trip-free mechanism is ideal for automatic lock-open.

3. Cost is in line with individual fuse lateral protection.

Sectionalizers Selected . . . These studies led to the selection of sectionalizers. The 13.8-kv circuits were planned for a maximum loading of 5,000 kva, and each was broken up into 15 or 20 sections, making possible a minimum load loss under fault conditions of approximately 250 to 350 kva. As new subdivisions or homes are built, laterals will be grouped and fed through a bank of sectionalizers to reduce sectionalizing to a minimum while continuing to provide adequate protection.

The low density and fault currents involved limited the sizes of sectionalizers to two: 50 amp in conjunction with 50-amp reclosers, and 100 amp in conjunction with 100-amp or larger reclosers and substation breakers. A 140-amp sectionalizer, recently made available, will replace the 100-amp unit used with substation breakers.

Application . . . On the San Antonio system supervisory control by the dispatcher is connected to every substation breaker except those at plants. The dispatcher-controlled system works exceptionally well with sectionalizers. All sectionalizers on the loadside of the dispatcher-controlled breakers are adjusted to count two openings of the breaker before tripping.

Thus, on permanent faults beyond the sectionalizers, the dispatcher notes the two openings of the breaker. When the breaker remains closed he assumes a sectionalizer has tripped and isolated the faulted section. Trouble calls indicate the affected area. Upon report of outages, a trouble man is directed by radio to the sectionalizer controlling the area without service. Upon direction, he closes the sectionalizer. When the lateral is permanently faulted, the substation breaker operates twice more and drops the sectionalizer. The trouble man must then seek out and correct the fault.

When a bird recently shorted a transformer, a signal was immediately

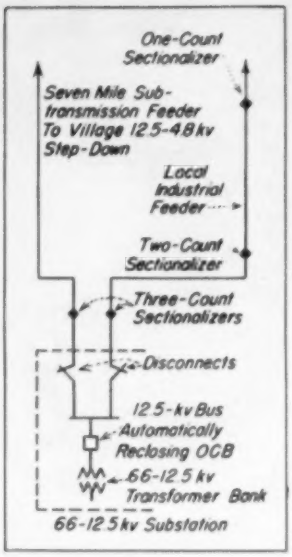


FIG 2—CIRCUIT shows coordination of sectionalizers with substation breakers

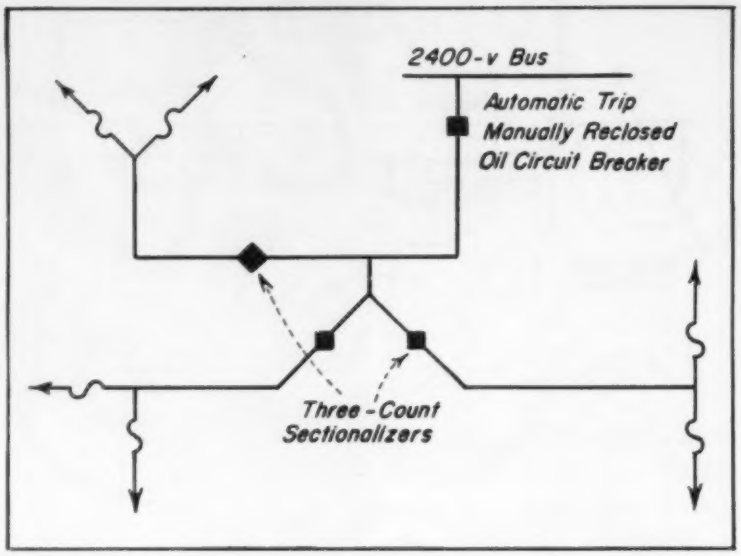


FIG 3—DIAGRAM shows the use of three-count sectionalizers in conjunction with attended station breaker. Operator must reclose the breaker within 45 sec to retain sectionalizer count

relayed by supervisory control to the system dispatcher, alerting him that breaker operations indicated a circuit fault. Minutes later customers in the affected area complained, and a trouble man was dispatched to the local sectionalizer. A repeat performance occurred when the sectionalizer was tried on the phase in trouble, and the trouble man was sent to survey the area. He discovered the faulted transformer which was cleared and restored to service in 85 min.

Load Loss Reduced . . . By sectionalizing a load of 250 to 350 kva, which is ¼ to 1/6 the load possible with the previous 4-kv distribution, less load is lost, and fewer customers put out of service. Fig 1 shows a distribution area, nearly all of which is being converted from 4 kv, and the location of the sectionalizers. As the circuit is relatively new, not much conversion has taken place close to the main bulk substation or along the trunk feeder. As demand warrants, conversion will continue, sectionalizers being added along the trunk feeder.

Conversion is proceeding on 26 13.8-kv distribution circuits and the location of 143 100-amp and 31 50-amp sectionalizers for both 3-phase and single-phase group laterals. More than half of these sectionalizers are already installed. As circuit conversion proceeds, additional laterals will be grouped and fed through sectionalizers for selective circuit coordination and protection.

New York State System . . . The New York State Electric & Gas Corp system comprises some 600 distribution circuits covering a third of the state. In many areas it has been difficult to designate fairly one preferred feeder, as two or three circuits often emanate from one substation breaker. On these circuits the substation breaker is usually more than adequate for load current purposes although its value for protection is limited because of its lack of selectivity with regard to its several feeders.

While heavy-duty reclosers on each feeder at or near the substation would be a partial solution to the utility's protection problem, such installations would deprive the substation breakers of practically all duty. Installation of sectionalizers in one or all main branches of a circuit, however, extends the protective coverage of the substation breaker to most of the circuit. But this application had the following limitations:

1. The maximum available short-circuit current at the point of the sectionalizer installation.

2. The maximum load current to which the sectionalizer will be subjected.

3. The ability of the breaker relaying to "see" faults to the ends of the circuit. It is necessary, of course, to allow a minimum fault current of at least two or three times the relay pick-up current.

The arrangement of oil sectionalizers as installed on a 12.5-kv system supplying two principal feeders is shown in Fig 2. As the total load on the breaker is less than 100 amp, the existing 600-amp breaker is more than adequate. The arrangement makes efficient use of the breaker for protection of both feeders without subjecting either to outages for faults on the other. The three-count sectionalizer just outside the substations serves also as loadbreak disconnect, and two and one-count sectionalizers in the right-hand feeder automatically sectionalize the line further.

A novel use of sectionalizers with a breaker at an attended substation (see Fig 3) produces better service at little equipment cost. When the station feeder breaker is tripped by a fault on one of the circuit's principal branches, the station operator recloses the breaker three times. As a three-count oil sectionalizer opens immediately after the third opening of the circuit breaker, the proper sectionalizer automatically clears the faulted branch. Upon the breaker's third reclosure, no matter how long delayed after the third opening of the feeder circuit breaker, the operator finds the line clear and the breaker holds in.

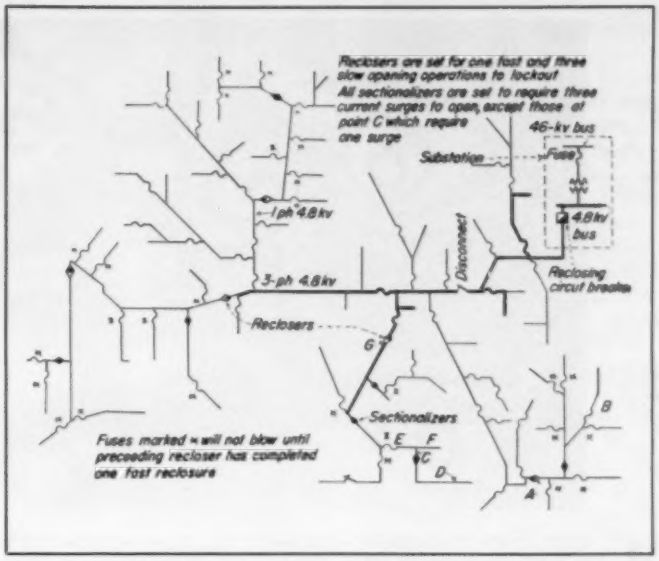


FIG 4—DIAGRAM shows coordinated use of substation automatically reclosing oil circuit breakers, oil circuit reclosers, sectionalizers and the usual branch line fuses

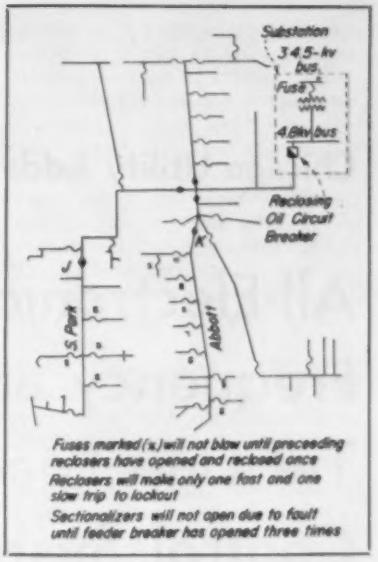

Substation
34.5-kv bus
Fuse
4.8kv bus
Reclosing Oil Circuit Breaker
K
J
S. Park
Abbott
Fuses marked (x) will not blow until preceding reclosers have opened and reclosed once
Reclosers will make only one fast and one slow trip to lockout
Sectionalizers will not open due to fault until feeder breaker has opened three times

FIG 5—SECTIONALIZERS at main junction take 3 OCB trips. Reclosers J, K lock out on 2nd shot

When the operator fails to make the first circuit breaker reclosure within 45 sec of the initial interruption, the sectionalizers "forget" the first count. A fourth reclosure of the breaker is then necessary. The second reclosure must be made within 45 sec after the second opening of the breaker. As shown in Fig 3, fuses are employed at the points where available short-circuit becomes too small to assure pickup of the station circuit breaker relays.

Recorded Interruptions . . . The operating record of the plant operator at the attended substations gave the utility a clear record of interruptions such as is not usually obtainable. During the first six months after installation, 13 instances of trouble on the circuit's three branches resulted in 25 trips of the oil circuit breaker. The proper sectionalizer six times dropped the faulted line section after three trips of the breaker. Service was completely restored seven times after one trip of the breaker indicating temporary faults. No interruptions occurred on any part of the circuit in the ten months following the six-month period of frequent interruptions.

A sectionalizer on the New York system opened during a fall of wet snow without tripping the substation oil circuit breaker. This unexpected operation, the utility believes, was caused by a high fault resistance of rapidly varying magnitude, such as can occur when a limb laden with wet snow falls across phase wires of a delta system. The current fluctuation apparently exceeded the 160-amp tripping current of the sectionalizer but did not reach a magnitude sufficient to cause much movement of the circuit breaker relays.

A direct wire-to-wire fault at the point of short circuit could have produced a current as high as 1,000 amp. The sectionalizer probably opened a fault current slightly less than 191 amp, the pick-up current of the oil circuit breaker relay. But the sectionalizer suffered no damage as its loadbreak interrupting rating is 225 amp.

This type of operation, where the sectionalizer clears the fault without a preceding opening of the oil circuit breaker, has occurred at several locations on the system. To avoid confusion, operating personnel have been advised to expect it occasionally. It happens because some high impedance faults cause widely fluctuating currents. A sectionalizer is inherently faster in operation than circuit breaker induction relays, and it is seldom possible to match the pick-up current of the circuit breaker relay with a sectionalizer having the same pick-up.

Typical Application with Oil Circuit Reclosers . . . A typical application of sectionalizers is shown in Fig 4. This feeder extends many miles into rural territory on a 4,800-v delta operation and consists of 108 circuit miles of line. Short-circuit and load conditions are particularly favorable to the use of sectionalizers in conjunction with oil circuit reclosers. Each sectionalizer has the same rating as the closer ahead of it.

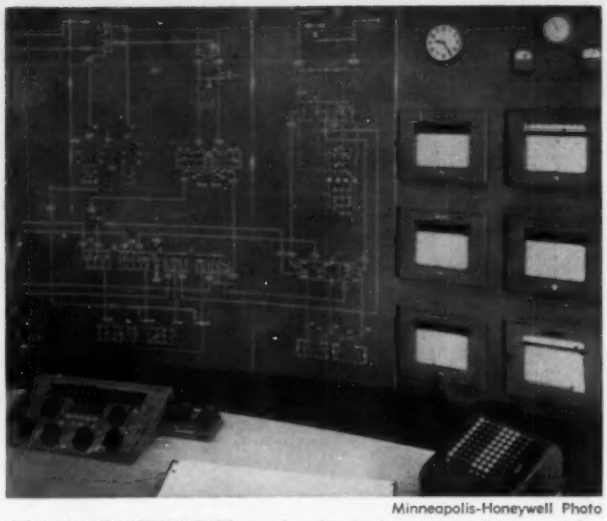
These oil circuit reclosers have one fast and three slow operations so that the circuit utilizes the recloser to obtain the equivalent of three-shot operation at the sectionalizer and two-shot operation of the fuses thereafter. Often reclosers are set for two fast and two slow operations so that two complete operations clear temporary faults before the protected fuse is blown. With one fast and three slow operations, a short circuit in the section of line protected by the fuse causes the fuse to blow after one fast opening and reclosing of the circuit recloser without permanently disturbing service in the section between the fuse and oil circuit recloser.

Faults in the section between the fuse and sectionalizer force the three-count sectionalizer to open immediately after the oil circuit recloser has opened for the third time. The recloser can then make its third and final reclosure to restore service in the section between it and the sectionalizer.

(*Continued on page* 184)

Chicago Utility Adds . . .

All-Electronic Frequency and Tie Line Load Control System



Minneapolis-Honeywell Photo

STRIP CHART INSTRUMENTS record tie-line load and system frequency information in Commonwealth Edison Company's central control room at Chicago

All-electronic recording and controlling equipment was installed recently by Commonwealth Edison Co of Chicago for "masterminding" the maintenance of system frequency and the securing of exact regulation of tie-line power loading. This new automatic tie-line load and frequency control equipment features impulse-rate telemetering and remote control of station generation by pulse signals.

The new equipment constitutes an electronic transmitting and receiving system, free of relays and contactors. Readings are transmitted by an impulse-rate system providing continuous measurement of power interchange between the company and its ties to the East and South. From these measurements, along with measurements of frequency and time drift, control impulses are automatically derived and routed to generating stations for control of turbine generators as required to maintain system frequency and scheduled interchange.

Recording and scheduling are focused in the console and panel of six strip chart recorders in the company's Chicago control room. As all six instruments have translucent green scales illuminated from the back, their high readability, coupled with convenient grouping of console switches, facilitates the dispatcher's job of scheduling power generation to meet demand.

Choice of Control Methods . . . Although recording and control functions for the whole interchange area are centralized, the new instruments are used in conjunction with previously installed recorders and signalling systems.

Old and new equipment have been assembled into a system permitting a choice of control methods from among the following:

1. Control of system frequency (flat frequency).
2. Control of interchange power (flat tie line).
3. Control at scheduled rate of interchange on the basis of frequency (tie line bias).
4. Manual control.

Any of the three automatic control methods can be used with or without time-error control. Under flat frequency control, system frequency is the only measurement used. Within the limits of their sensitivities, generating station turbine governors tend to maintain constant frequency. As major load changes occur, however, governor characteristics permit frequency to change beyond acceptable limits. The instruments recognize these frequency variations and initiate control impulses for adjusting the governors to restore correct frequency.

Flat Tie-Line Control . . . Under flat tie-line control of a system in an interconnection, a neighboring system is depended upon for control of frequency. All interconnections with that system are telemetered to the control center where equipment generates governor-control impulses to maintain net interchange at a scheduled rate.

Under tie-line bias control each system measures frequency and meters all interconnections with other systems. These quantities are used to derive control impluses based on the requirements of the control area alone. As long as system frequency is correct, control is based on actual net interchange with the neighboring systems. When frequency deviates from normal, the controller regulates for interchange different from schedule so that at high frequency power flows into the system, and vice versa. The amount of bias used depends upon the schedule and is established by agreement among interconnected companies.

Dispatcher Controls Schedule . . . From his central location the dispatcher can schedule interchange at a desired level, establish the rate of schedule change, and set schedules to start taking effect at any time within 60 min. He sees frequency changes and the attendant time error recorded on one chart by a two-pen instrument.

Time errors of -30 to $+10$ sec can be shown, affording a wider range than was possible with the superseded time-error recorder. The new installation can alter frequency to eliminate the time error.

Mounted in the lower right corner of the Chicago control room panel is the illuminometer, a multiple-record

type of strip chart recorder. Although not directly part of the load-and-frequency control circuit, it helps in matching generator output with demand. The illuminometer receives signals from photocells, situated in various parts of the city, which sense changes in daylight caused by clouds, storms, heavy smoke, fog, and nightfall. By noting areas where daylight is fading, the dispatcher anticipates changes in demand for lighting power.

Old Equipment Integrated . . . The new equipment has been installed around and is used in conjunction with previously acquired instruments and telemetering systems. In the dispatching office old-style mechanical potentiometers remain in use for recording station loads. Another combination of old and new occurs in the telemetering systems used by Commonwealth Edison and its neighboring utilities. Some tie-in stations use tone-modulated carriers, others a simple milliampere system. At tie points these signals are converted to equivalent impulse signals for transmission to Chicago.

The new system is so well planned and laid out that the function of each part is readily apparent. New dispatchers are quickly trained and can assume full charge in minimum time.

Pulse Frequency Conveys Data . . . In the new Metrotype system load at each station is measured by an adapted watthour meter. Sectors of the shiny meter disc have been painted black to reflect alternating amounts of a light beam into a photocell. As disc speed goes up as load increases, any change in load alters the rate of the electrical impulses generated in the phototube.

Other values, such as dc millivolts, milliamperes, or shaft position are changed to pulses by an oscillator device whose impulse rate is proportional to the measured variable. Frequency is established by rectifying part of the oscillator output and balancing it against input. Any difference acts to shift frequency to the balance point.

Impulses, either from the special watthour meter or the oscillator unit, are amplified and sent to the central dispatching office. There they are converted to dc to actuate recorders. A change in pulse rate alters the mean energy level of the signal so that the strength of the rectified signal is an indication of variable measured.

Signals based on pulse rate can be transmitted long distances by means of microwave, carrier-current, or wire-line channels without loss of signal information through line resistance, leakage to ground, fading, or distortion. Zero signal is represented by a fixed impulse rate to provide both positive and negative readings and to differentiate between zero reading and transmission failure.

Tie Readings Totalized . . . Load signals are totalized by an impulse-counting and retransmitting circuit consisting of three parts:

1. Separate input channels for each line.
2. A control unit.
3. A transmitter.

Each incoming impulse generates a trigger voltage which registers in a storage circuit. At regular intervals the control unit scans each storage circuit, resetting it to zero and sending on the number of impulses stored there. Only one storage circuit of the several input channels is checked at a time. In this way the output circuit receives only one impulse at a time.

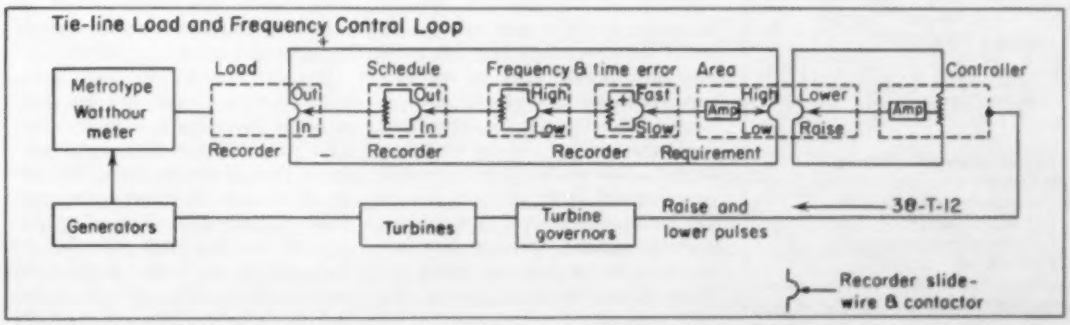
The totalizer transmitter receives output impulses from the several totalizer elements. These pulses are applied to a bi-stable multi-vibrator and then to one or more dividers which reduce and smooth out the impulse rate. The last-stage divider gates a transmitter circuit which may provide voltage or current impulses as required. The result is that all output impulses have equal amplitude, and the rate is proportional to the total number of impulses received. The complete totalizing cycle of receiving, storing, scanning, reshaping, and transmitting takes about 0.1 sec.

Errors Initiate Control . . . Telemeter impulse signals coming into the Chicago central office are changed to a steady dc voltage proportional to the received impulse rate. Incoming pulses pass through a standardizing circuit which generates a trigger voltage for each impulse. The trigger sets off a univibrator which runs for a time interval of a fixed number of microseconds. During the time interval, a condenser is charged by a constant current. The charge leaks off the condenser through a resistor during the quiescent time of the univibrator.

An increase in the impulse rate increases the number of times per second that the condenser is being charged and hence builds up a higher voltage. The voltage on the condenser, measured by a recording potentiometer, is thus proportional to the average number of pulses received each second by the standardizing circuit.

Readings showing deviation from scheduled load appear on the schedule and area-requirement recorders. Frequency and time error are also recorded at this time. Any unbalance in the control loop causes "raise" or "lower" impulses to be sent to the turbine governors to reestablish scheduled conditions.

(*Continued on next page*)



STATION LOAD IMPULSES from special wattmeter are amplified and sent to control room, there converted to dc and recorded

All-Electronic Frequency and Load Control

(*Continued from page* 101)

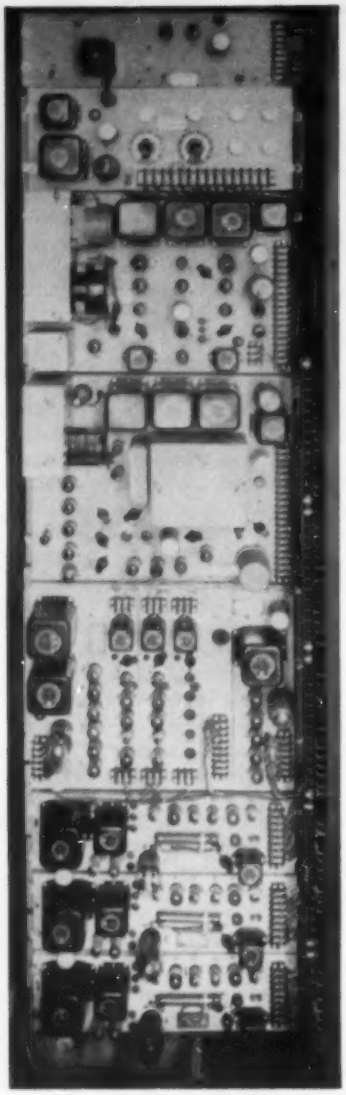
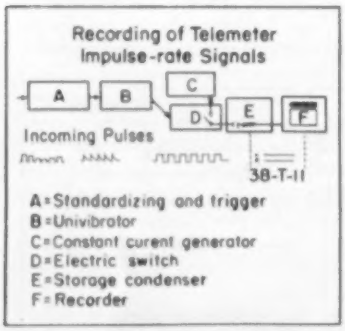


PHOTO shows front view of load and frequency control rack installed in control room



INCOMING PULSES are changed to steady dc voltage that is proportional to the incoming impulse rate before recording

Control pulses are produced when any deviation from the schedule or frequency causes an unbalance (error signal) in the control loop. This error signal, when amplified, drives a motor at a speed proportional to the error, or until maximum motor speed is reached. Coupled to the motor is a disc with a hole in it. Each revolution of the disc allows a light beam to pass through the hole to a phototube. The phototube output is amplified and operates a relay once for each passage of the hole.

The error signal is used also to control a phase-sensitive circuit, arranged to determine the direction of the error and to operate a corresponding relay. The phototube relay generates control pulses, and the directional relays determine whether it is to be a "raise" or "lower" signal.

An auxiliary circuit, containing a selector switch, adjusts the length of impulses. Another circuit is arranged to cause an increase in the length of impulses when an extreme error occurs. The amount of error prerequisite to this change in pulse length is adjustable.

Simulates Manual Control . . . To prevent "overshooting" on a correction, a circuit has been provided which disconnects the impulse relay when the instrument is approaching balance. When the instrument does not reach balance in a given time, this circuit drops out and more impulses are generated. The time constant of this circuit can be selected to match the average recovery time of the power generating system. It can also be switched out and not used if desired.

Another auxiliary circuit generates one impulse whenever the area-requirement recorder goes off the set point. On a very tight loop this pulse may do a major share of the control. On looser networks the effect is hardly noticeable. On the other hand it is quite noticeable in flat frequency control. This automatic pulse method closely resembles the accepted procedure for manual control in which the operator makes a series of slight adjustments in the governor setting until load and frequency are in step with demand.

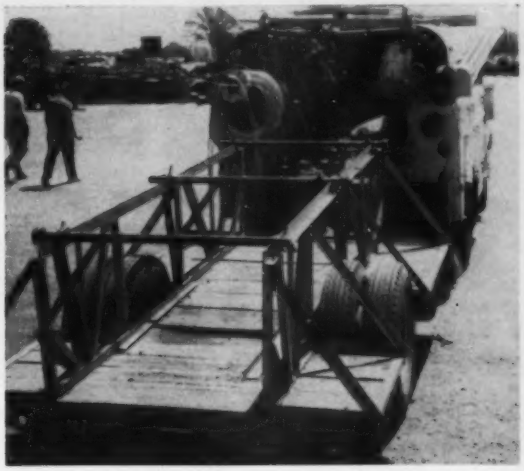
With centralized automatic control, the dispatcher is concerned mainly with two elements of the load control equipment: The panel containing the electronic strip chart instruments, and the control console. The console contains selector switches and keys for regulating tie-line schedules and operations, pilot lights to show current tie-line schedules, and alarms for excessive load changes.

Three recorders on the left side of the panel show the status of the Eastern tie, the Southern tie (a sum of ties with several other companies), and the net or algebraic sum of these ties. Each recorder has a second pen to show the desired schedule. This pen is not involved in the controlling action but monitors the position of the schedule setter.

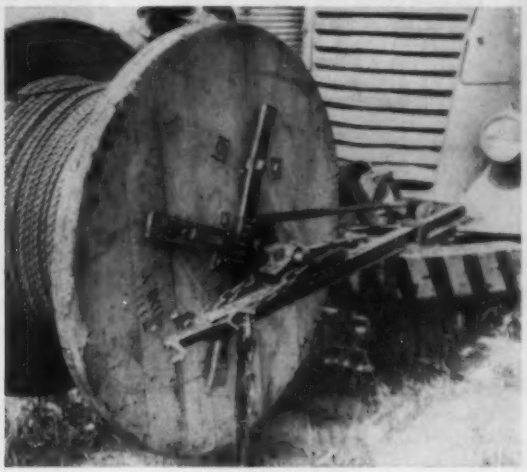
Center-Zero Instruments . . . The sum of all unbalances in the different recorders is read by the area-requirement recorder which shows in megawatts the amount of power change needed to match demand, biased by frequency and time drift. The four load-recording instruments have center-zero scales, readings appearing as megawatt differences from zero. When the area-requirement recorder moves away from zero because of some unbalance in the other recorders, the associated controlling mechanism generates "raise" or "lower" impulses. The resulting changes in power generator output restore the area-requirement recorder to zero.

Associated with the equipment are several alarms and drop-outs. A chime is provided in the area-requirement recorder at $\pm 50\%$ of scale, and a trip-out at 100% of scale. On the frequency recorder, contacts close at $\pm 1/20$ cycle change from 60 cps to start clocks showing the length of time that frequency remains outside the permitted limits of 1/20 cps.

The net recorder has two scales, and a limiting contact switches automatically from the low to the high scale when the incoming signal goes above the lower-scale limit. The recorder remains on upper range until reset by the dispatcher. The dispatcher can key shift manually to high scale at any time. Lights in the recorder show which scale is in use, and the schedule pen automatically moves to the proper point.



MULTI-REEL TRAILER holds three reels and has been used for many underground and overhead jobs as well as hauling heavy equipment



TAKE-UP REEL is mounted on the front bumper of this truck. It is powered by a chain from a sprocket on the front-end winch

Multi-Reel Trailer Cuts Time 50% on Many Jobs

F. A. BELL, Construction Superintendent
JOE M. HINDS, Asst to Division Manager,
Mississippi Power & Light Co, Jackson, Miss.

A multi-reel trailer has been used by Mississippi Power & Light Co for many jobs with time savings of over 50% on some of the applications. The trailer eliminates manual handling of reels and use of reels jacks. It has also been used for hauling heavy equipment and as the base for a mobile substation.

On jobs requiring cable or wire the reels are loaded on and unloaded from the trailer at the storage yard with a crane. Then the trailer with reels is towed to the job and returned after the work is completed.

For underground work the trailer is spotted and chocked at the manhole where the cable is to be pulled in. The truck is located at the other end of the duct run. Cable is pulled with a line attached to a take-up reel that is mounted on the front of the truck and chain-driven from a winch. Time savings of at least 50% have been realized with this application of the trailer.

Several overhead jobs have also been speeded up with the trailer. On one the trailer carrying three reels of 4/0 copper was towed to one end of a proposed pole line, which had been framed and guyed, and the conductors were tied off on the deadend pole. The trailer was then towed to the other end of the line at a very low speed, allowing the conductors to unreel in an orderly manner.

A groundman followed close behind the trailer to keep conductors separated, and a lineman then placed conductors on the cross arms. When stringing was completed, conductors were sagged. The entire operation, executed in 7½ hours, saved about 50% of the time formerly required.

Using the same method three 336,400-cir-mil ACSR conductors were strung 3,300 ft across a pasture and two roads with 60% savings in time. Another section of this line was pulled in across soft ground. This was accomplished by parking the trailer at one end of the line and the truck at the other end. A 1-in. stringing line was pulled from the take-up reel on the front of the truck to the trailer and attached to all conductors. Conductors were then put in stringing blocks on the pole at the trailer.

As conductors were pulled to a pole, they were laid up on stringing blocks, which were quick-mounted on top of the cross arm, thus eliminating conductors dragging on the ground. The complete operation including framing of eight poles required five hours, instead of 12 hours.

The trailer has also been used to haul heavy equipment such as transformers. By removing eight bolts side frames of the trailers can be removed to make a flat bed. For emergency power the transformers can be set on the trailer, hauled to the site, and connected, after a temporary fence is set up around the trailer.

Air Break Switch Saves Breaker Cost, Helps Service

MARVIN GEBHARDT, System Operations and Planning Engineer,
Minnkota Power Cooperative, Inc, Grand Forks, N. D.

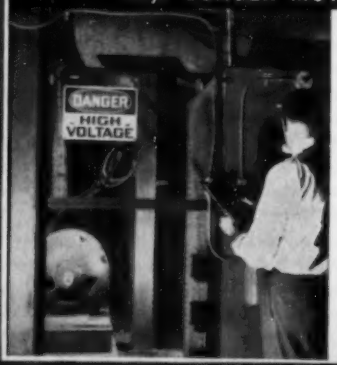
A motorized air break switch and relaying scheme installed at Minnkota Power Cooperative's Rindal switching station improved service from the station. Moreover, the additional sectionalizing facilities saved the part of difference in cost between the air break switch and a circuit breaker.

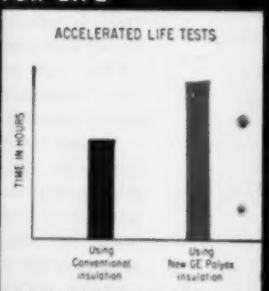
The air break switch was installed in a 75-mile long.

(*Continued on page* 106)

AN ELECTRODE'S EYE-VIEW of a high voltage blast shows how General Electric's new Polyex insulation can withstand greater voltage—without breakdown—than any other Class A insulation in use today.

50% LONGER MOTOR LIFE





New Polyex insulation takes extreme heat aging and mechanical stress.

For users of motors from 100 to 3000 hp...

G.E. Develops NEW Insulation That Is 7 Times Tougher—Adds 50 Percent to Motor Life

Revolutionary *POLYEX* insulation gives added margin of protection against motor failures—reduces maintenance costs.

General Electric has developed a complete new insulation for form-wound coils which lasts 50% longer than any other Class A insulation in use today. Its greater ability to withstand physical and thermal stresses, and resist contaminants, provides an added margin of protection that will mean tremendous savings to you because of reduced motor failures and reduced maintenance costs.

POLYEX INSULATION is a balanced system of polyester films and fibres, together with new hydrocarbon resins. For the first time, materials used are inherent insulators in themselves, and the cotton and paper-based tapes and sheets, used in conventional insulations, have been eliminated.

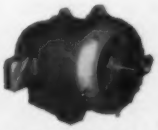
A FEW OF THE EXHAUSTIVE TESTS on new Polyex insulation are summarized on these pages. Insulation qualities like these offer you tremendous savings in motor maintenance and a greater degree of service continuity than ever before possible.

FOR FURTHER INFORMATION, contact your nearby G-E Sales Representative, or write for Bulletin GED-2460, Section 830-15, General Electric Co., Schenectady 5, New York.

HERE ARE G-E LARGE MOTORS EQUIPPED WITH POLYEX INSULATION

Vertical TEFC

Vertical Weather-Protected



Totally-enclosed fan-cooled

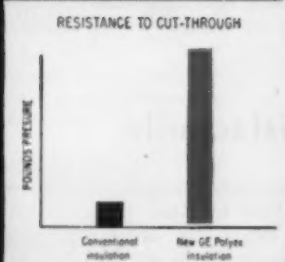
Open Dripproof

Grade-mounted weather-protected

Base-ventilated w/ather-protected

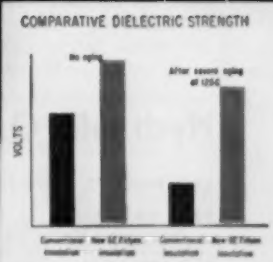
Totally-enclosed air-water cooled

7 TIMES GREATER PHYSICAL STRENGTH



Cut through test proves G.E.'s new Polyex insulation has extra protection against much greater physical stress.

50% HIGHER DIELECTRIC STRENGTH



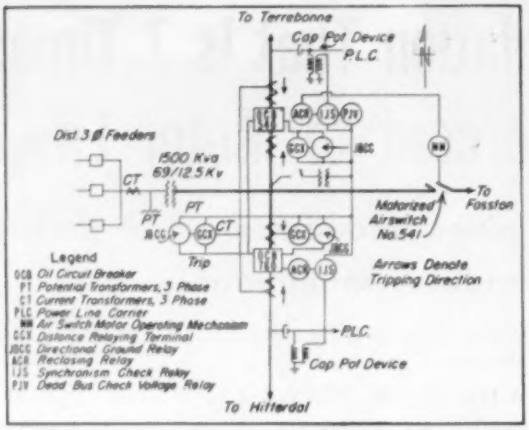
Tests prove new Polyex insulation can withstand much higher voltage stresses.

Progress Is Our Most Important Product

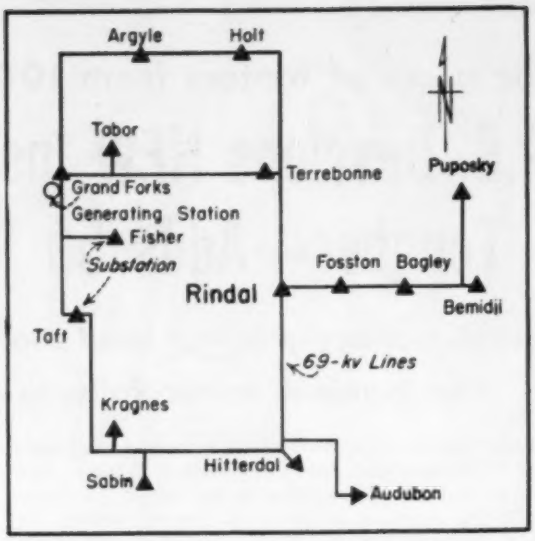
GENERAL ELECTRIC

Air Brake Switch

(*Continued from page* 103)



AT RINDAL STATION the motorized air break switch was installed to improve service for local distribution and for the long tap



TRANSMISSION SYSTEM of Minnkota Power Cooperative operates as 69-kv loop with 75-mile, 69-kv tap going east from Rindal station

69-kv tap going east out of the station, which is in a 69-kv loop. Relaying coordinates the operation of this switch with two oil circuit breakers in the lines going north and south. Operation of switching at the station is as follows:

1. For a temporary fault toward Terrebonne OCB and the supply breaker at the Grand Forks steam plant substation will trip open. The Grand Forks supply breaker will reclose and re-energize the line up to OCB 540. The synchronism check relay will then permit OCB 540 to reclose.

2. If there is a permanent fault toward Terrebonne OCB 540 and the supply breaker at the Grand Forks steam plant substation will trip open. The Grand breaker will reclose three times and then lock out. Reclosing of OCB 540 will be blocked by the IJS synchronism-check and PJV voltage relays.

3. For a temporary or permanent fault south of Rindal OCB 760 operates similarly to OCB 540 for a fault north of Rindal.

4. With a temporary fault toward Fosston both OCB's 540 and 760 will be tripped open simultaneously by their protective relays. The dead bus check PJV voltage relay will permit OCB 540 to reclose, restoring service to the local 1,500-kva transformer and the 75-mile line. The IJS synchronism-check relay on OCB 760 will permit it to reclose providing the transmission loop is in synchronism.

5. And for a permanent fault toward Fosston both OCB's 540 and 760 will be tripped open simultaneously by their protective relays. The dead-bus check PJV voltage relay will permit the recloser on OCB 540 to go through its cycle. If the second reclosure is unsuccessful then Switch 541 is opened by the RS contact of the ACR recloser on OCB 540.

OCB 540 then recloses for the third time and restores service to the local 1,500-kva transformer. The IJS synchronism-check relay on OCB 760 permits its ACR reclosing relay to operate and close OCB 760, thus restoring the loop to a closed condition.

Hydraulic Operators Perform Satisfactorily

I. L. PHILLIPS, System Planning Engineer, and

PAUL PASTERNAK, Jr. Engineer, Electric Equipment Dept, Pennsylvania Electric Co, Johnstown, Pa.

E. R. PERRY, Application Engineer, Allis-Chalmers Mfg Co, Boston, Mass.

Pennsylvania Electric Co's experience shows that hydraulic breaker operators have worked satisfactorily during the first year. One of the three operators in the initial installation has over 1,400 operations while the three combined have a total of over 3,500 including tests.

There has been no misoperation or failure of the operators, and no maintenance has been required. However, minor design changes have been found necessary.

First hydraulic operators were installed on breakers at Union City switchyard because of its ideal location. Two of the three 115-kv lines to the switchyard are without lighting protection. Thus the operators are subjected to severe duty. If trouble developed a breaker can be readily removed without appreciably disturbing customer service or system operation.

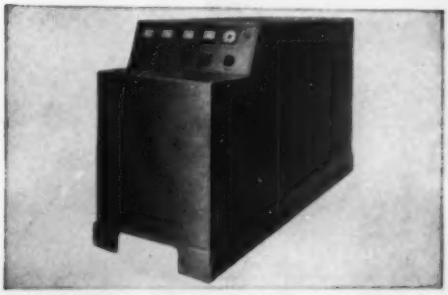
Operators were placed on three breakers, rated 3½ million kva, 115 kv, 1,200 amp, in the fall of 1953. They were set for 20-cycle reclosing at 1,800 psi in the hydraulic system instead of the rated 11 cycles. This was

(*Continued on page* 112)

PORTABLE test set has four wheels, equipped with roller bearings for smooth, easy handling.

GENERAL ELECTRIC'S D-C CABLE-TESTING SET IS SAFER, MORE ECONOMICAL

MOBILE set is mounted in a road trailer. The versatility of this equipment can be greatly increased by the addition of a fault-locating set.



STATIONARY set, rated 50 kv, 250 ma, has fully enclosed housing. It is ideal for a substation location.

To help protect the operator, General Electric's 50-kv d-c cable-testing set is fully enclosed—has an all-steel, dead-front panel. The high-voltage terminal for connecting to the cable is located at the rear of the cabinet, far from the operator, where it can easily be protected from accidental contact. Each set is provided with a discharge switch to automatically ground both the set and the cable under test when the set is de-energized.

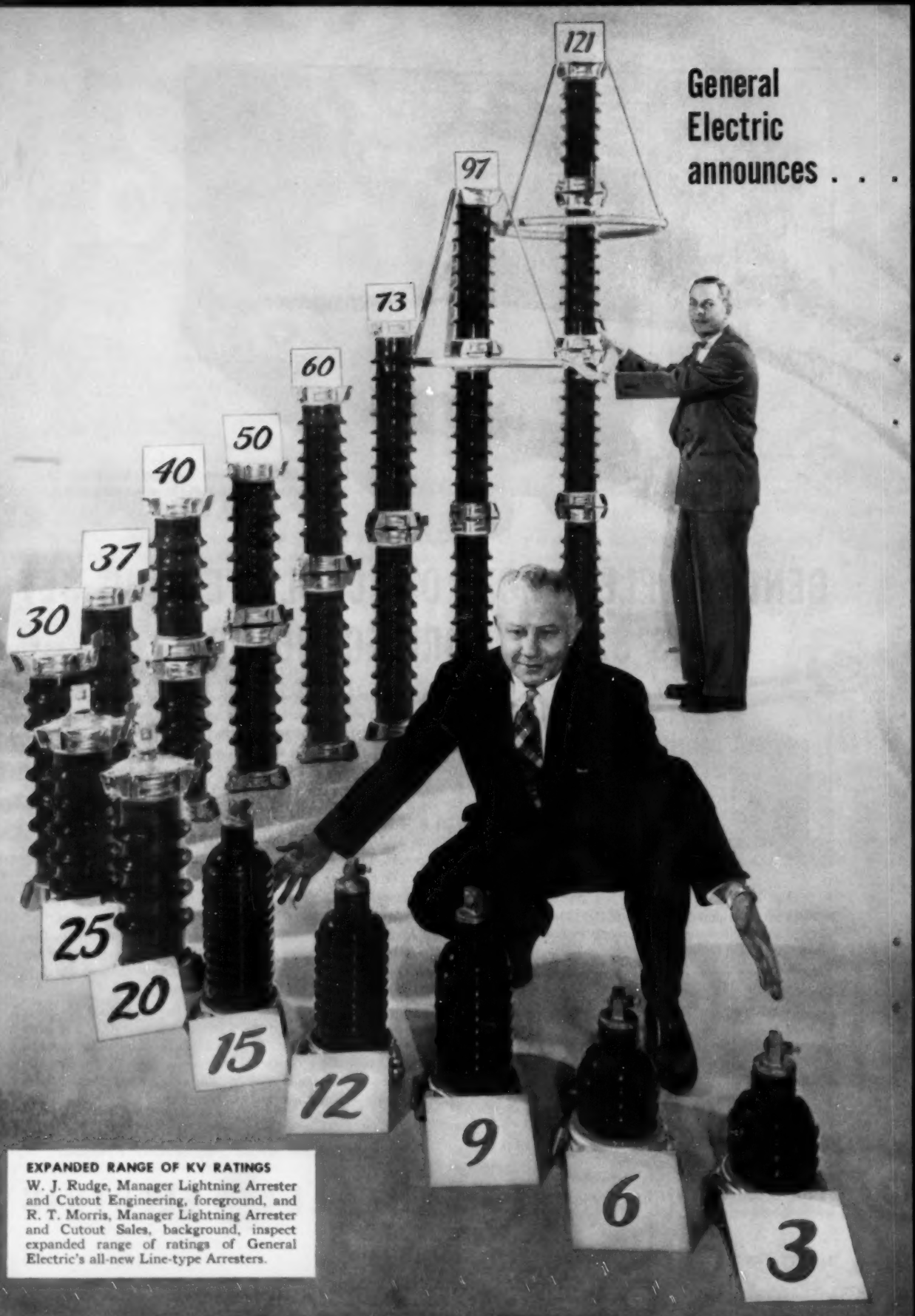
It is economical to use a d-c set for installation acceptance and periodic cable tests, because of the low charging currents required, thus keeping the demand on station auxiliary power to a minimum. For this 50-kv set, the 230-volt power demand is only about 3 to 4 kw. Furthermore, because it is available in either 100 ma or 250 ma capacities, this same set is effective for fault reduction.

More and more utilities are finding G-E testing sets the ideal method for checking the condition of their cables. A simple comparison of the leakage current measured during periodic tests with that obtained during the original acceptance tests tells the story.

Available in stationary, portable or mobile models, this set has many features which contribute to its safe, economical operation. For more information about the 50-kv set or other G-E cable-testing units in ratings of 75 to 375 kv contact your nearest G-E Apparatus sales office or write for Bulletin GEA-4595. Address General Electric Company, Section 422-18, Schenectady 5, New York.

Progress Is Our Most Important Product

GENERAL ELECTRIC



EXPANDED RANGE OF KV RATINGS

W. J. Rudge, Manager Lightning Arrester and Cutout Engineering, foreground, and R. T. Morris, Manager Lightning Arrester and Cutout Sales, background, inspect expanded range of ratings of General Electric's all-new Line-type Arresters.

ALL-NEW SERIES OF LINE-TYPE ARRESTERS

NEW! Expanded range—ratings 3 through 121-Kv

NEW! 20% better protective level

NEW! Magne-valve action in line-type arresters

Here is General Electric's new series of THYRITE* Magne-valve line-type arresters —revolutionary in design, exceptionally high in co-ordinated protective efficiency and in endurance. Seven new standard arrester ratings have been added to broaden the new line from 3 through 121-Kv.

Exclusive Magne-valve action is the key to the superior performance characteristics of this new arrester. This is accomplished by *magnetic* action of the series gaps aided by *valve* action of improved Thyrite valve disks. Already successfully applied to G.E.'s new THYRITE station-type arresters, and thoroughly proved since 1950 by thousands of service operations, Magne-valve action now applied to new line-type arresters means far higher reliability. For example:

BETTER PROTECTIVE LEVEL—Has 10% lower impulse sparkover voltage and 20% lower IR discharge voltage (see graph below)—representing a degree of protective efficiency *heretofore unobtainable in any line-type class of lightning arrester.*

LIBERAL DISCHARGE CAPACITY—Easily withstands the industry-standard long duration current test, as well as the industry-standard high current test of 65,000 amperes (5x10 ms wave).

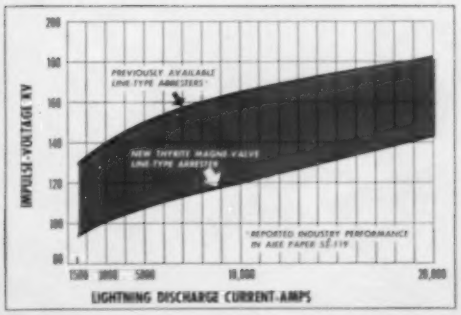
MORE STANDARD RATINGS FOR MORE APPLICATIONS—At numerous small or medium sized transformer substations, or switching substations, small sizes of metal enclosed switchgear (where limited space has heretofore been a problem), and at load centers.

G.E.'s new series of Thyrite Magne-valve line-type arresters is already a service-proven product available for your system. For full details, including performance data, check your nearest G-E Apparatus Sales Representative or write to General Electric Company, Schenectady 5, New York. Ask for Bulletin GEA-2978. 433-12

*Registered Trademark of General Electric Company.

Progress Is Our Most Important Product

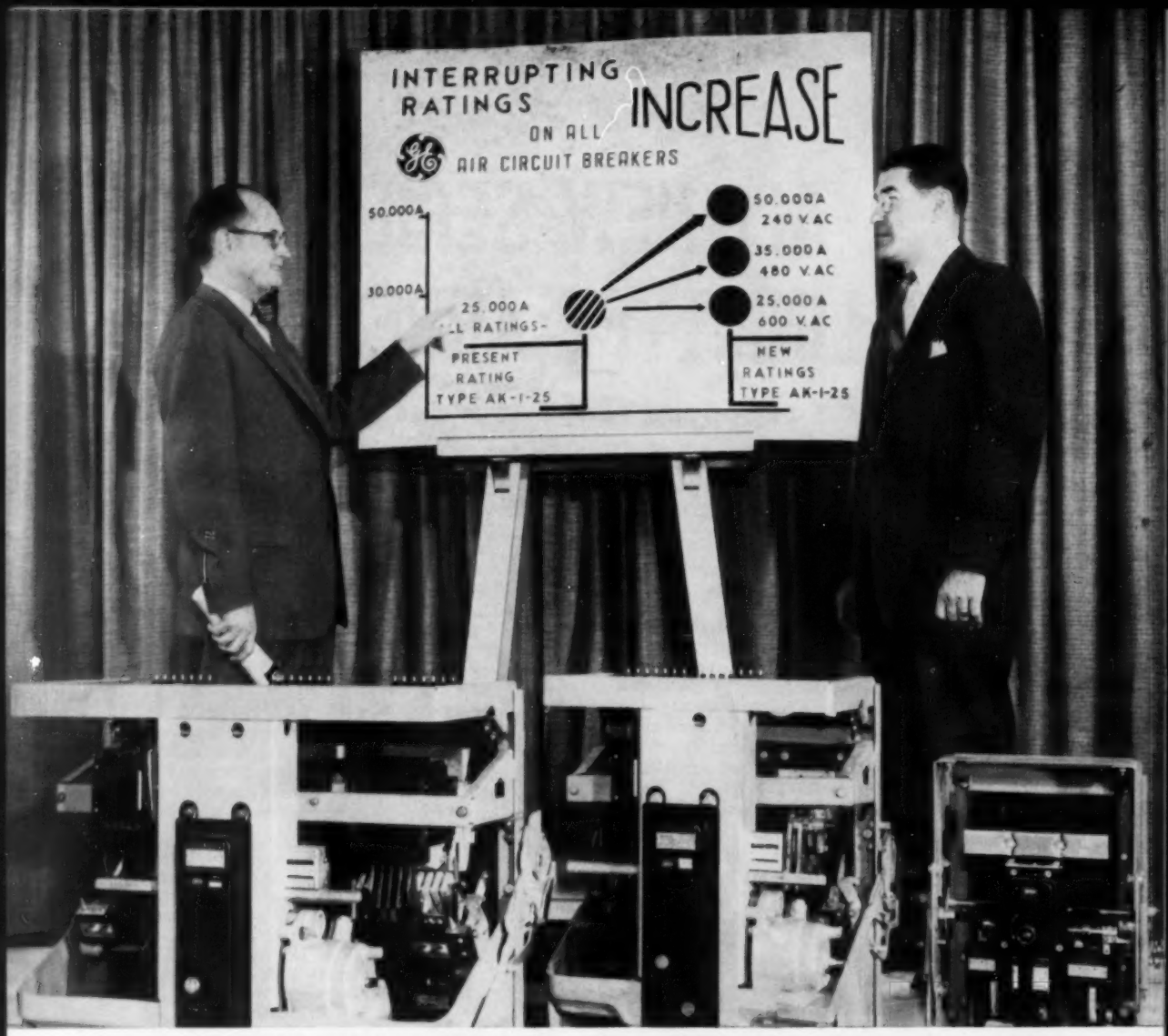
GENERAL ELECTRIC



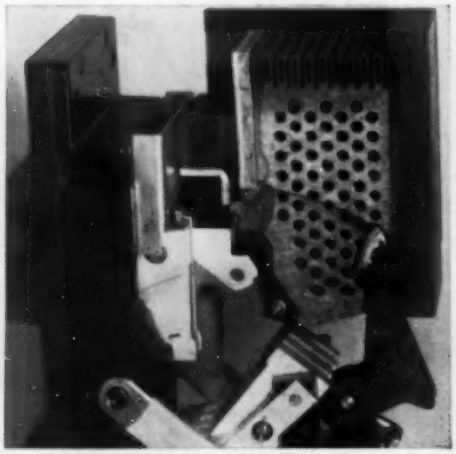
20% MORE PROTECTION compared to latest industry performance characteristics.

GAP UNIT with magnetic coil and pre-ionizing elements interrupts arc in less than half a cycle.

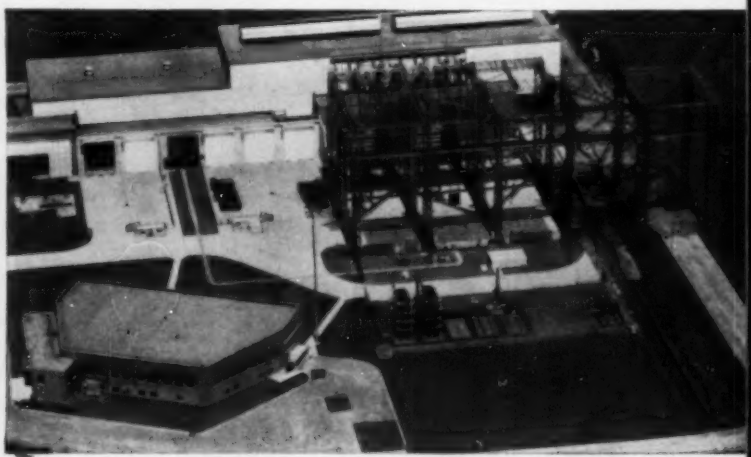
LOOSE GRAIN IMPULSE TESTING under pressure assures uniform quality of Thyrite disks.



Don Beeman, Manager—Industrial Power Engineering—and Ben Beall, Manager—Air Circuit Breaker Engineering, discuss the importance to customers of the new breaker interrupting rating increases. Chart refers to only one example of the new breaker interrupting ratings.



MULTI-SLOT INTERRUPTERS provide the extra interrupting ability that makes this increase possible.



EXTENSIVE TESTING of all breakers at the Switchgear Development Laboratory have proven this extra interrupting ability for operation at popular voltages.

General Electric Air Circuit Breakers

INTERRUPTING RATINGS INCREASED

Appreciable Savings Now Possible in Many Low Voltage Switchgear Applications

INTERRUPTING RATINGS HAVE BEEN INCREASED from 25 to 50% on all popular ratings of General Electric Type AK air circuit breakers. Tests have shown that the efficient multi-slot interrupter is capable of interrupting higher currents at 480 volts A.C. and below.

THESE NEW RATINGS OFFER SIGNIFICANT SAVINGS in switchgear for customers using 208, 240 and 480 volts A.C. For example, in a typical commercial building utilizing a 208-volt system capable of a 100,000 ampere fault, the AK-1-25 feeder breaker may now be used where formerly an AK-1-50 feeder breaker would have been required.

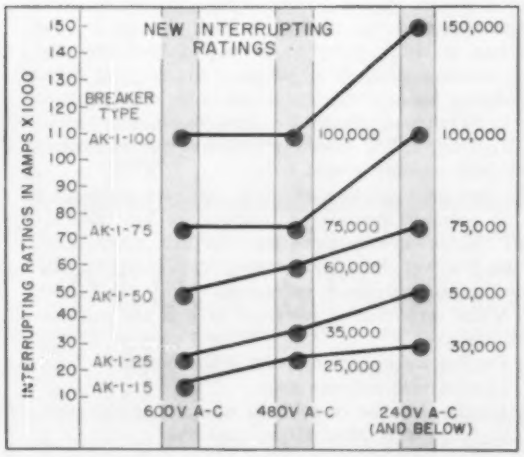
SAVINGS in a typical industrial plant application are shown in the table below.

MORE EFFICIENT USE OF SPACE is made possible through the application of smaller air circuit breakers with reduced space requirements.

NEW APPLICATION INFORMATION on air circuit breakers can be obtained from your nearest G-E Apparatus Sales Office, or write for Bulletin GET-2479. Address your request to General Electric Company, Section 526-1, Schenectady 5, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC



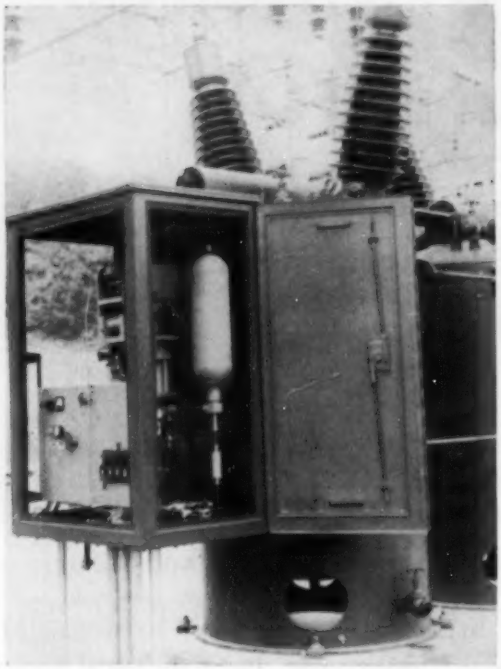
NEW INTERRUPTING RATING INCREASES of 25 to 50% are shown for the popular 240 and 480 volt a-c systems.

System Voltage	Transformer Rating	Price Change of Switchgear with Main and 6 Feeder Breakers
208 V.	1000 Kva	28% REDUCTION
480 V.	1000 Kva	27% REDUCTION

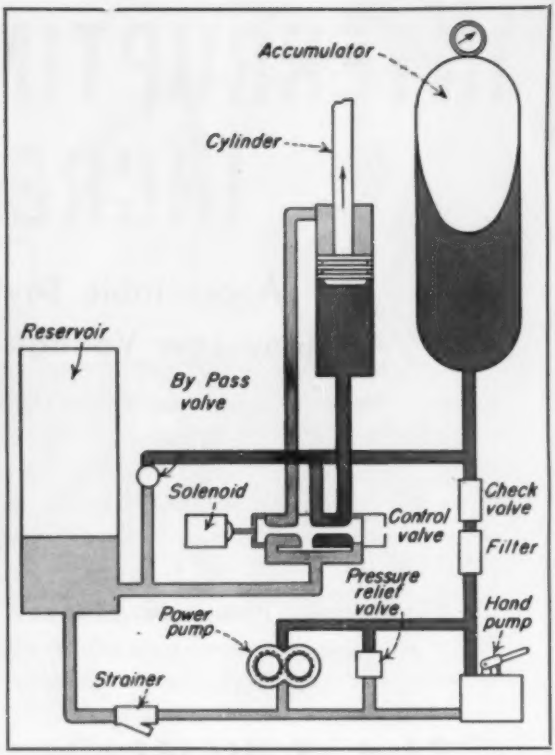
TYPICAL EXAMPLES of cascade systems show appreciable savings in switchgear for customers with newly assigned interrupting ratings.

Hydraulic Operators

(*Continued from page* 106)



HYDRAULIC OPERATORS are installed on three 3½-million-kva, 115-kv, 1,200-amp breakers, located at Union City switchyard



HYDRAULIC SYSTEM shows components in closing position. By-pass valve, moved from hand pump to new position, stopped reservoir foaming

done to prevent closing in on an uncleared fault.

Periodic checks of the operators indicate no evidence of linkage wear in spite of the number of operations. Leakage between the high and low-pressure systems through the control valve is sufficient to operate the pump one min out of 24 hours.

The hand operated hydraulic pump speeds routine breaker inspection considerably. A few strokes of the handle or release of the hand operated valve brings the operating rods to any desired point for checking tolerances, contact penetration, and latching. It is not necessary to fully trip the mechanism for inspection.

Reclosing with the hand pump during a control power outage has not been necessary. However, the system has been charged by hand numerous times for tests and demonstrations, and the breaker has been closed manually at full speed through a small lever attached to the solenoid. Where manual operation is frequent, the lever should be brought out to the front or side of the cabinet.

One condition developed during a demonstration that did not affect operating speed nor capacity but did require operator design changes. A small amount of oil foamed over the top of the reservoir after numerous closely spaced manual reclosures during very cold weather. This occurred on the final closing when the accumulator pressure was low.

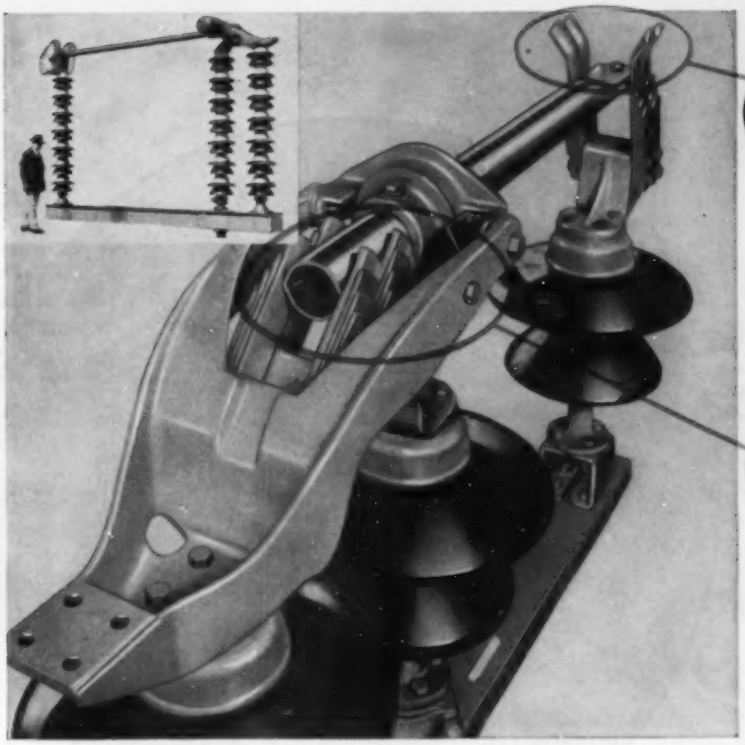
Subsequent low-temperature (—40F) tests at Massachusetts Institute of Technology showed that entrained air is released as the oil passes from high pressure to atmospheric pressure. If the released air is pumped back into the high-pressure system it will collect in the accumulator rather than become entrained in the oil. At the final closing during the demonstration considerable air which had collected, left the accumulator and bubbled through the reservoir.

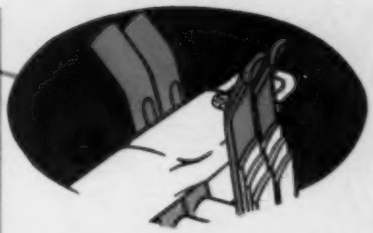
To correct this trouble several changes were made. The by-pass valve was moved from the hand pump to the location shown in the accompanying illustration. This change prevented air released through the valve from collecting at either pump to be pushed back into the high-pressure system. A larger reservoir having a baffle (not shown) between the intake and outlet was installed. The baffle allows released air from the control valves to diffuse out of the reservoir before it can recirculate to the high pressure system.

To date no inspection schedule has been established for the operators because no maintenance has been required. However, experience indicates that maintenance will be less with hydraulic components. Therefore, the following checks are made every month:

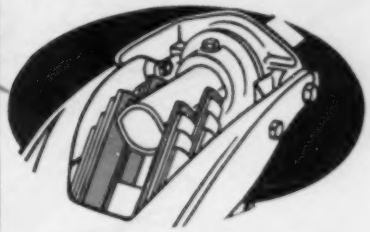
1. Visual inspection of reservoir oil level and accumulator pressure.
2. Possible leakage at any point in the system.
3. Elapsed time indicator tests.
4. Heater operation or evidence of moisture collection.

(*More How To on page* 118)





Rolled copper contact shoes carry the current independent of sturdy beryllium alloy pressure-applying springs. MK-40 Switches take full advantage of electrical and mechanical characteristics of materials used.



Identical contact at hinge end illustrates large spring deflection. This maintains firm, uniform contact pressure during years of service. There are no other springs or moving contact surfaces. Metals at point of contact are corrosion and abrasion-resistant silver-to-copper.

You may prefer MK-40 Air Switches on Contact Performance alone

and benefit from all these other MK-40 advantages

- Simplified, factory sealed blade operating mechanism which raises and twists the blade when opening. Develops maximum force where most needed. Blade is locked in both open and closed position.
- These switches have the same simple basic design in all rated sizes: 7.5 kv to 380 kv, 400 to 5000 amperes.
- Greaseless non-rusting rotating insulator bearings.
- Fully adjustable operating mechanism parts with pipe piercing set screws to eliminate slippage.

A vital feature of MK-40 switches is their contact efficiency. They provide safe, direct current flow with minimum of current interchange surfaces. They retain uniform contact pressure throughout years of service. They readily withstand year-round weather and corrosive atmospheric conditions. They permit visual inspection and easy maintenance.

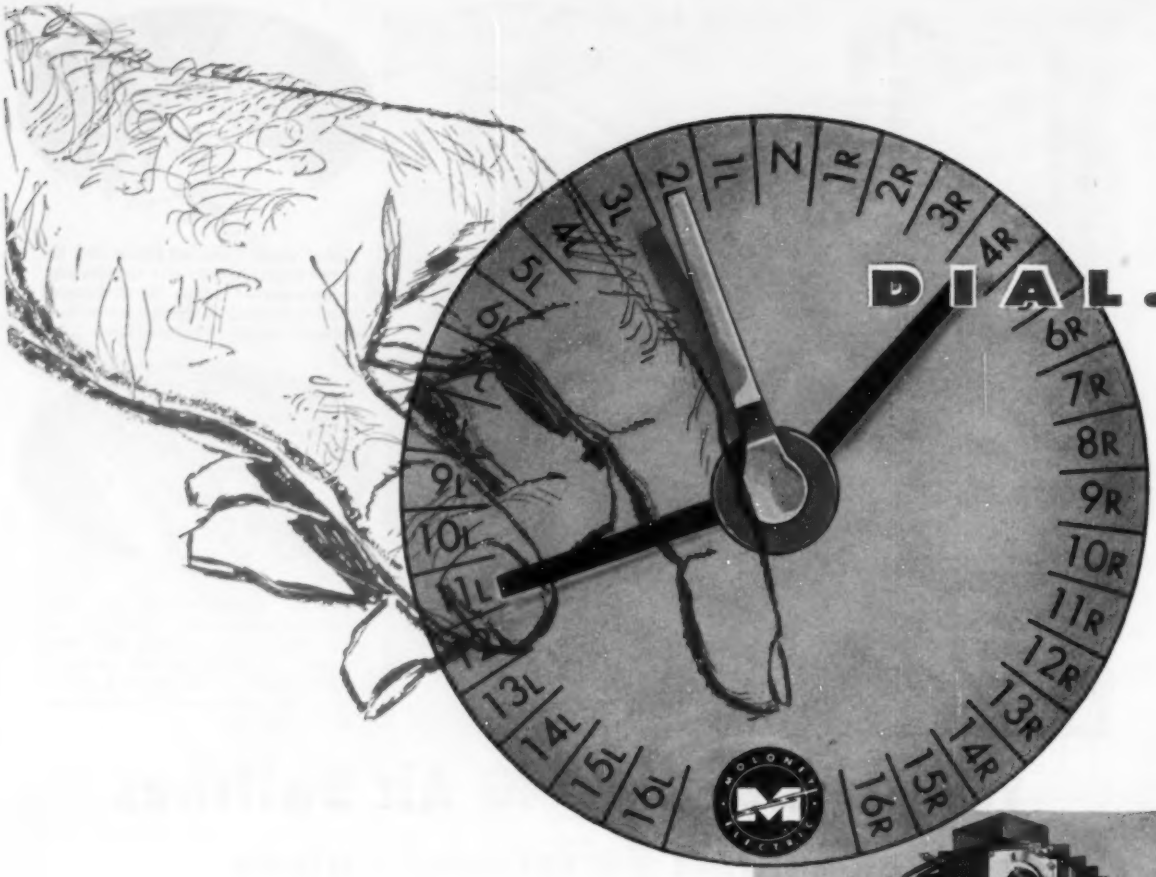
Contacts are high pressure silver-to-copper *at both ends* of the tubular blade. This logically, simply eliminates flexible shunts. Silver-to-copper resists corrosion and abrasion. Rolled or drawn sections, used throughout blade and contact assembly, are excellent heat conductors. They have ample volume to carry away heat generated under short circuits—for *efficiency and safety.*

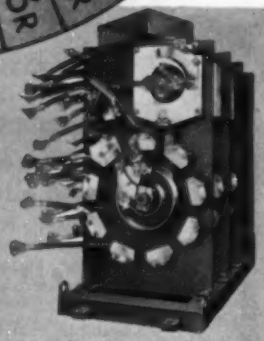
The same basic contact design is proved in service on all DELTA-STAR MK-40 Switches—from 400 to 5000 amperes and from 7.5 to 380 kv. They will prove their special value to you.

When you want the best in high voltage switches specify the MK-40

DELTA-STAR ELECTRIC DIVISION

H. K. PORTER COMPANY, INC.
OF PITTSBURGH
2437 Fulton Street • Chicago 12, Illinois
District Offices in Principal Cities





Moloney Load Tap Changing Switch mechanism provides continuous full load operation at any operating point. Can safely handle short circuits or ground faults reaching 25 times full-load.

SEND FOR
BULLETIN NO. LTC-2907

M O L O N E Y E L E C

Power Transformers • Distribution Transformers • Step Voltage

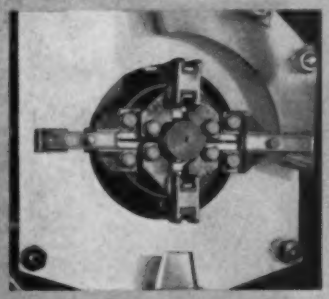
Load Center Transformers • Unit Substations • Network Transformers

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES

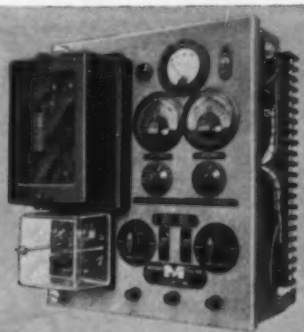
. . "M" FOR MOLONEY

The dial on your load tap changing equipment not only tells what position is being tapped, buck or boost, and the lowest and highest position reached . . . it also tells whether or not you dialed "M" for Moloney . . . the most dependable regulating equipment you can buy. Right there is the familiar Moloney Trademark, your assurance of dependable, trouble-free long operating life. Learn why the Moloney "M" has become the "Sign of Quality" to utilities everywhere.

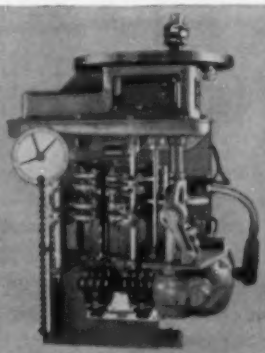
M699-4



Moloney Load Transfer Switch combines by-passing of switching reactor during full cycle position with rugged current interrupter. All arcing tips are easily accessible for quick maintenance.



Moloney Controls provide a sensitive voltage regulating relay, with a wide range line drop compensator to give a perfect balance between voltage deviation and regulating equipment.



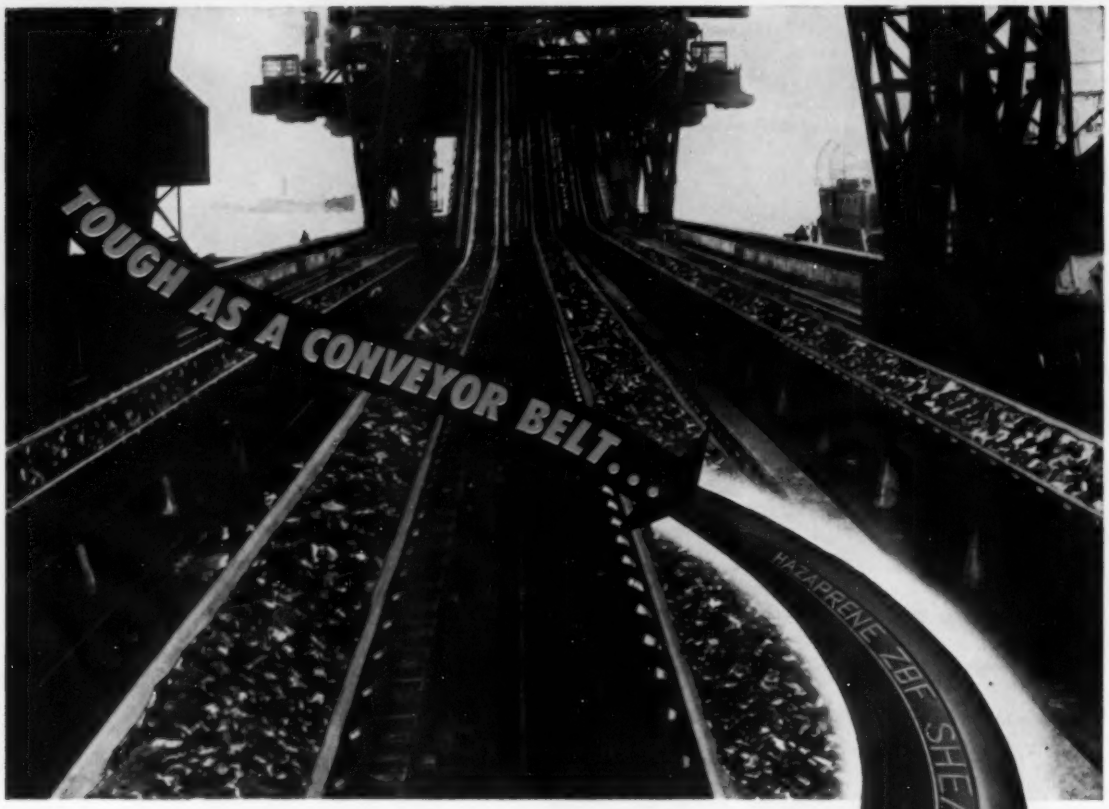
Moloney Drive Mechanism contained in an accessible weatherproof compartment has noncorrosive or protected parts to resist atmospheric conditions.

T R I C C O M P A N Y

Regulators • Regulating Transformers • Load Tap Changing Transformers
Constant Current Transformers • Capacitors • Transformers For Electronics

MOLONEY ELECTRIC

AT ST. LOUIS 20; MO. AND TORONTO, ONT. CANADA

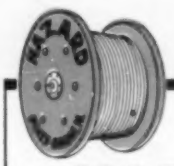


and for the same reason: MOLD CURING

Every foot of rubber-faced conveyor belting in service today is vulcanized in a metal mold—mold-cured—to give it the toughness it must have to stand the continuous sharp blows, grinding abrasion and shattering vibration of its day's work.

Every foot of Hazacord is mold-cured, too—from tiny flexible cords to heavy high-voltage shovel cables—guaranteeing the toughness that keeps electrical equipment on the job in the roughest locations and worst possible weather. Hazacord cables are built to last with an insulation that is electrically and mechanically strong—protected by a Hazaprene ZBF sheath made with neoprene under a formula that brings out all of its toughness and weather resistance. They have proved their "sticking" power by years of trouble-free operation in such rugged services as coal and metal mining, steel mills and utility portable distribution centers.

Whenever you need a portable cord or cable, it will pay you to specify Hazacord—mold-cured to give the same toughness and long service life you expect from mold-cured conveyor belts. See your jobber or your nearest Hazacord representative for information on Hazacords or write for Bulletin H-451, Hazard Insulated Wire Works, Division of The Okonite Company, Passaic, N. J.



2146

HAZACORD

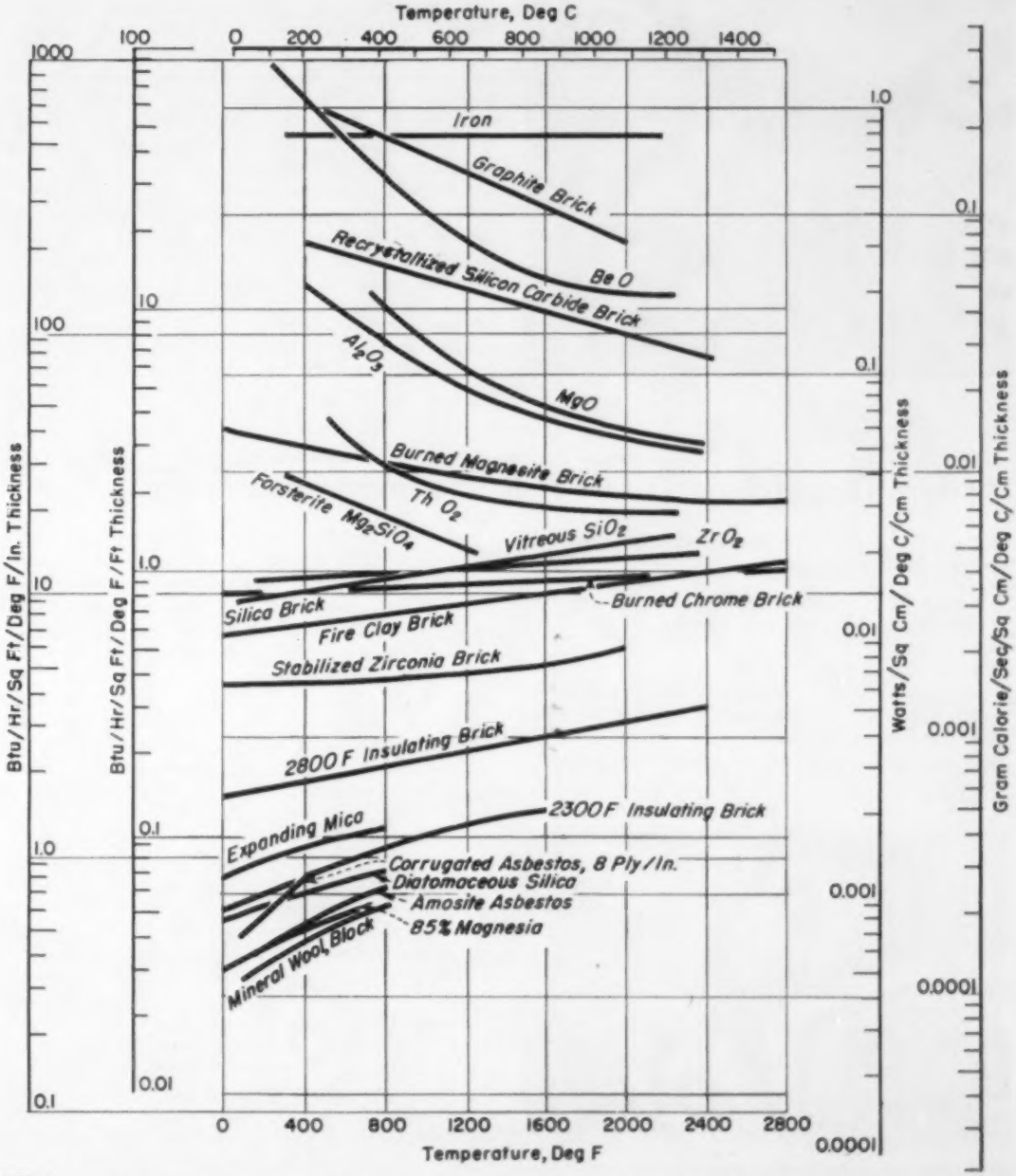
Mold-Cured

portable cables

PRODUCT OF OKONITE RESEARCH

Thermal Conductivity of Refractory Materials

Chart gives mean thermal conductivity values for refractory materials in four units of measurement. Data were furnished by Battelle Memorial Institute.



Similar data for common pipe coverings will appear as Engineering Reference Sheet No. 55-6 in Electrical World, March 21, 1955.

First Sealed-Type Subway Transformer Installed

JOHN R. KELLEY, Engineer of Underground Distribution, Department of Water & Power, Los Angeles, Calif.

Obtaining as near a hermetically sealed transformer as possible is the primary objective of the Department of Water & Power in specifying and purchasing a new type of subway distribution transformer. Extended life is one of the benefits expected from this new type. To gain operating experience and determine actual costs, the Department recently installed the first of these transformers, a 50-kva, 4,800-120/240-v unit.

In this new design the gasketed handhole has been eliminated; the main cover is welded to the tank. Entrance on the primary side is through a bayonet-type fitting with a sheath-to-nipple wipe. Porcelain bushing of the locked-type with stud connectors are utilized for secondary connections, which are taped. This arrangement is particularly adaptable to the Department's paper-lead primary and thermoplastic secondary cable systems as used in residential underground districts.

The manufacturer provides a nitrogen-filled space over the oil and a valve arrangement for periodic pressure checking. Initial purchase of 50-kva units was considered a method for stimulating interest in sealing transformers.

PRIMARY CABLE ENTRANCE to sealed-type, 4,800-120/240-v subway distribution transformer is made by the bayonet method (right). Wiped joint (left) completes the job. Extended life of unit is expected

Modern Dispatching Office Is Remodeled Substation

W. R. GAUSE, Chief Dispatcher, Florida Power Corp, St. Petersburg, Fla.

The new St. Petersburg dispatching office was built with a view to administering loads on the Florida Power Corp System which, according to plans, will reach an estimated peak of 700 Mw by December, 1957.

This dispatching office occupies a remodeled substation from which all oil circuit breakers have been transferred to a new outdoor substation. It is manned by eight dispatchers, a chief, and an assistant chief dispatcher.

VIEW of left side of Florida Power Corp's new dispatching center shows part of dispatching board, load and frequency control panels

On the second floor of the two-story building is the dispatching board consisting of 12-gauge steel panels, similar to switchboard panels, bolted together and with seams filled to give a smooth surface. A straight portion 10 ft on either side of center joins, on the right, a curved section on a 20-ft radius. A 6-ft straight section on the right completes a 45-ft board.

The board is painted light green, matching the walls, and offers a contrast to colored plastic tape representing different voltage lines and substations. Magnets, ½-in. in dia, indicate switch positions. These are painted white to show an open switch; red for a switch open and tagged "red" for clearance; blue for a tag giving permission to a workman to operate a switch for testing; and, yellow for a switch tagged for automatic cutout for hot-line work.

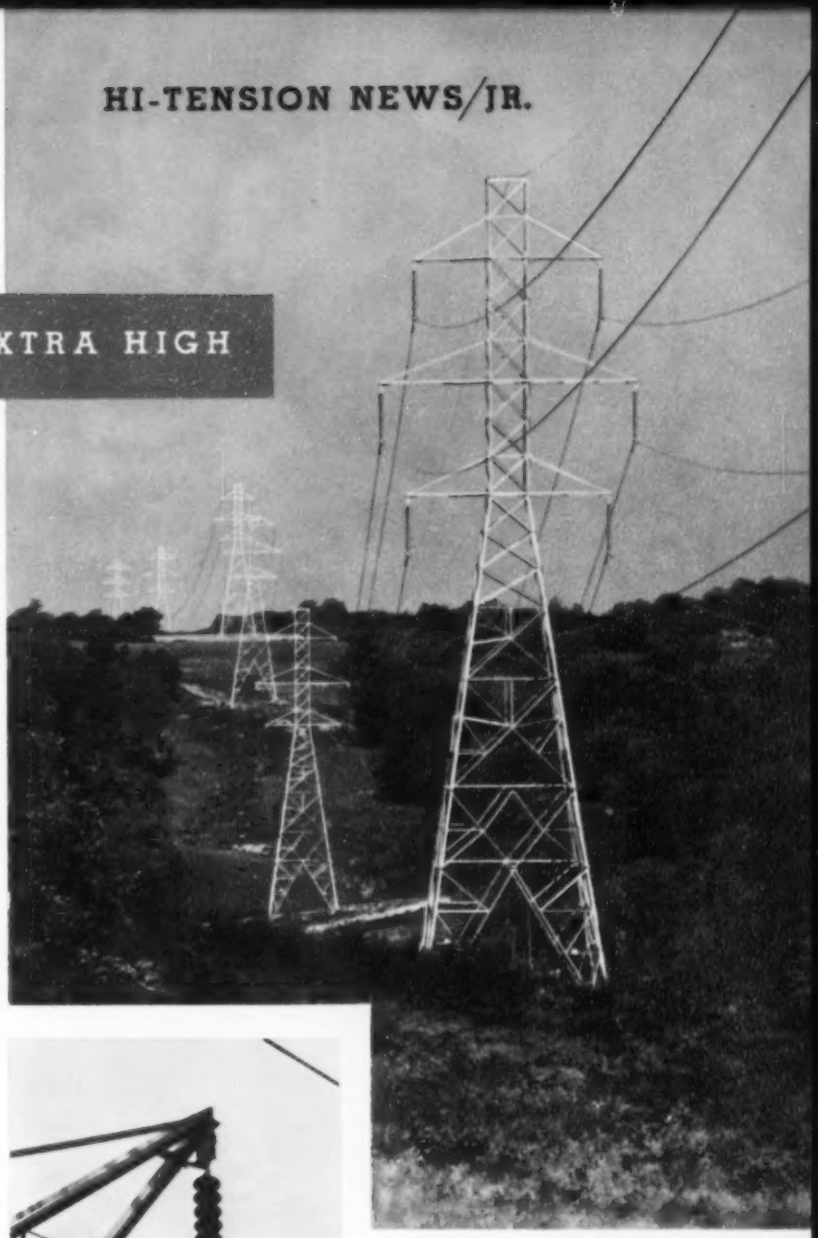
Lighting for the board is slightly in front and on the same contour. Additional lighting for the room is provided by eight 500-w silver bowl bulbs. Incandescent lighting was chosen because it reflects system surges, assures continuous light even at low voltage and affords pleasant lighting for round-the-clock operations.

To the left of the dispatching board, load and frequency instrument panels have been installed on the same radius as the right side of the board. Two desks for dispatchers on duty are paralled to the straight section of the board with a load and frequency control console separating them. A third desk is near the back of the room.

(*Continued on page* 123)

HI-TENSION NEWS/JR.

WHAT IS EXTRA HIGH VOLTAGE TRANSMISSION?



What is extra-high voltage transmission? It's a little bit like asking how fast man can fly—the limit is constantly being raised!

Whatever its level may be, extra-high voltage transmission has always been a region of continuing research and investigation for Ohio Brass Company. Close league with the men and organizations who continually force transmission levels higher has enriched the entire O-B staff with an understanding of present-day insulation requirements that is unmatched in the insulator field.

Because of that understanding, Ohio Brass is able to design and produce insulation of the highest character. And it is significant that Ohio Brass insulation has been selected for use in every extra-high voltage project now operating or under construction in the Americas.

OHIO BRASS COMPANY
MANSFIELD, OHIO

Typical construction on OVEC 330-kv line, an "extra-high voltage" transmission project. Shown in the inset is a combination of Ohio Brass suspension insulators, O-B suspension clamp, and O-B control ring used on the OVEC line.

Ohio Brass

INTRODUCING—

THE SECOND GENERATION OF

O-B Offers a Complete Line of Bushings Fully Meeting New ASA Standards

Continuing 40 years of successful bushing manufacture, Ohio Brass announces its new bushing meeting all requirements of ASA Standards. First group of O-B bushings in regular production corresponds with the present range of published standards for operating voltages from 23 to 69 kv.

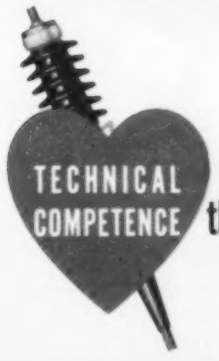
Development will soon be completed for progressively higher voltage models and, within a short time, the O-B series will span all system requirements.

At the strong insistence of the Electrical Industry for a simplified, interchangeable set of bushing standards, the present ASA specifications were developed. These reflect the thinking of both users and manufacturers of transformers, oil circuit breakers, and bushings. This new standard offers the opportunity for a great reduction in the variety and complexity of bushings on any system, and can materially relieve the high cost of replacement inventories.

Detailed information on these new ASA Standard bushings is now in the hands of O-B District Managers who will gladly discuss the high refinements of this product in the light of your own particular interest.

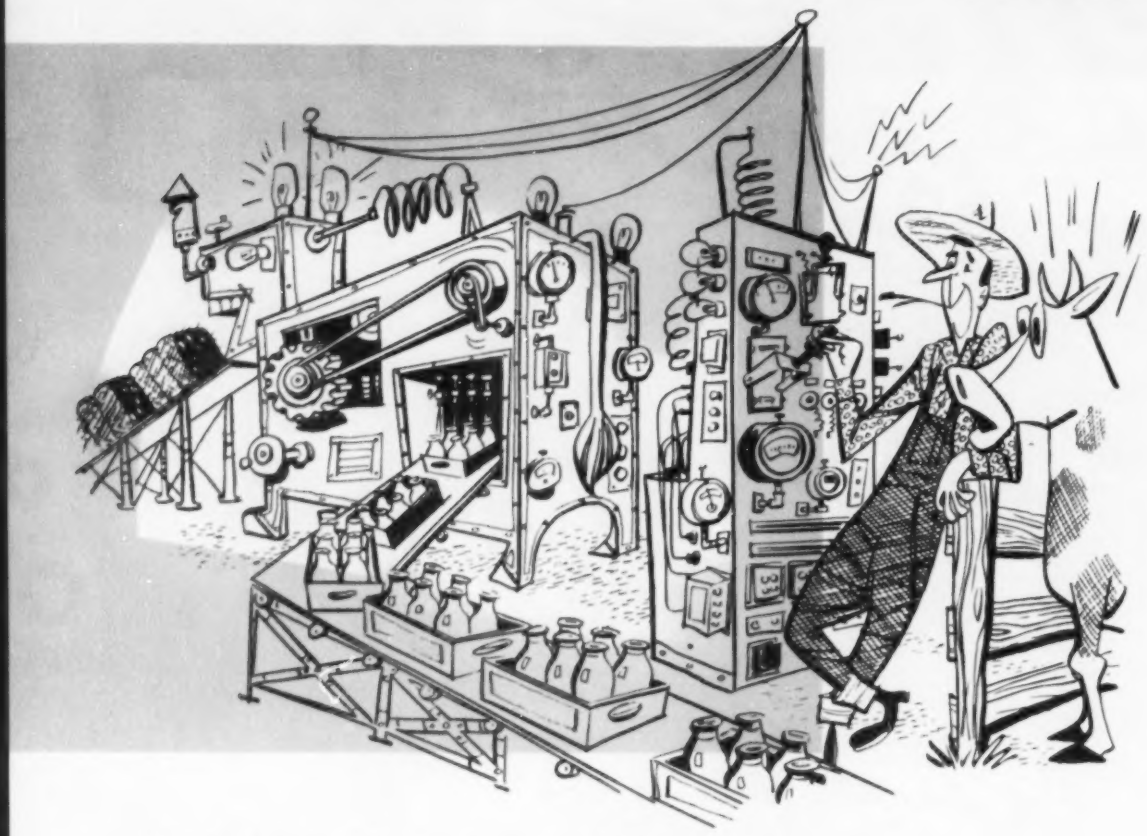
OHIO BRASS COMPANY
MANSFIELD, OHIO

THE FINEST BUSHINGS EVER MADE



the heart of every *Ohio Brass* bushing

THEY HAVEN'T REPLACED THE COW... YET

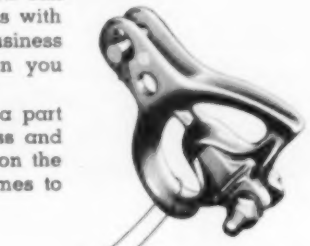


But it isn't too hard to believe that much of the familiar farm scene is going to change drastically in the next few years. New electrical equipment in the barns – and in the homes – is pushing the demand up at a swift rate; fast enough, in fact, to equal the steel industry load in five more years.

If your system is involved in such rural load growth, you can count on Graybar to back up your own building time tables with adequate stocks, delivered promptly. Graybar makes a business of knowing what you need, and having it available when you need it.

O-B distribution materials – insulators and hardware – are a part of the Graybar stock. Close cooperation between Ohio Brass and Graybar assures you that insulators and hardware will be on the spot when you need them. Depend on it when the time comes to improve and expand your system!

OHIO BRASS COMPANY, MANSFIELD, OHIO



Ohio Brass

Distributed by GRAYBAR ELECTRIC COMPANY

4532-H

Dispatching Office

(*Continued from page* 118)

Dispatching communication facilities are grouped into three identical turrets, connected in tandem and recessed into desks. Each circuit has a talk-and-hold key and a supervision lamp, and dialing has been provided for circuits requiring it.

Terminating at each turret are two system carrier-current channels utilizing single-frequency duplex sets; three direct lines with automatic ringing to Bayboro plant, to St. Petersburg division distribution dispatching office, and to the telephone company's long-distance board; two unlisted lines to the telephone company's commercial board; and, an intra-company PAX line. Two intercom circuits communicate with other offices in the building. The dispatcher also has available a radio base station.

The dispatching office maintains eight interconnections with other utility companies. Telemetering on three ties with the Southern Co and three with Tampa Electric Co operates in conjunction with load and frequency control to adjust generation at Avon Park, Higgins, and Suwanee power plants. Plans call for telemetering three more steam plants and two ties with Florida Power & Light Co.

Ice Machine Saves Time and Trouble when Filling Coolers

CHARLES KELLER, Superintendent Underground Dept, Toledo Edison Co., Toledo, Ohio

An ice machine installed in Toledo Edison Co's service building provides a safer and more convenient way of making 200 lb of ice cubes a day for water coolers. Estimated savings by using the machine will pay for the investment in two years.

Added safety is provided because the cubes go into the coolers easily and there is no cracking of ice. Therefore, hazards of using ice picks are eliminated. The method is also more sanitary.

To facilitate filling coolers with cubes without spillage a funnel was made from standard water bucket. A hole was cut in the bottom of the bucket and a piece of tin was soldered to the bottom.

As a further aid in handling ice cubes a scoop, similar to that used in grocery stores, was made of tin.

Electric Band Saw Proves Versatile

CHARLES KELLER, Superintendent of Underground, Toledo Edison Co, Toledo, Ohio

A light-weight, electrically driven band saw is being used by Toledo Edison Co to cut cable and steel quickly and safely. It weighs approximately 10 lb and operates on 115 v, 6.5 amp, ac or dc.

The saw will cut a 500 MCM, single-conductor, lead-covered cable in 10 sec or less and requires no lubrication for such work. Greater safety is provided when using the saw for cutting junk cable in downtown areas as this job was previously done with an axe.

The saw has also proved valuable in steel tower construction work where steel must be cut to make it fit properly. Raising the saw with a hand line is easier than lowering and raising steel members. Wax lubrication is used when cutting steel.

ON TOWER WORK band saw is easy to handle, gets fast results, and saves manhours

COMPACT NETWORK
Save Cost of Vault

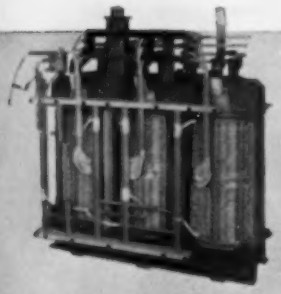
NIAGARA MOHAWK POWER COMPANY solved a space problem with these Allis-Chalmers network transformers. Increasing loads in concentrated areas in Buffalo, N. Y., called for transformers rated higher than those for which the vaults had originally been built. Considerable changes in the vault sizes might have been required. But the compact design of these Allis-Chalmers network units made it possible to fit 750-kva network transformers in vaults that were originally designed for 500-kva transformers.

Fast Delivery

In addition to saving vault reconstruction costs, Allis-Chalmers methods helped handle an unexpected load growth emergency. These units were originally scheduled for delivery in April, 1954. They were actually shipped five months ahead of schedule, thus facilitating system improvements.

1½ Million KVA in Operation

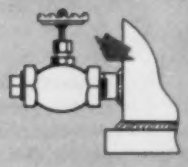
Excellent design, compactness, and good service explain why over 1½ million kva of Allis-Chalmers network transformers are on the job in utilities throughout the country. Utility experience with these units has proved their economy for installation and operation. Before you consider your next network installation, it will pay to get complete facts about Allis-Chalmers network transformers. Call your nearby A-C district office, or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-4495



Compact, low-loss design. Thermal capacities are high for contingency load conditions. Sturdy, time-proven core and coil construction meets repeated short-circuit stresses of network operation.

DESIGN AND CONSTRUCTION FEATURES

Safe, dependable no-load tap-changing mechanism. Handle inserted through two-inch opening on cover operates the tap-changing mechanism. Handle cannot be removed unless it is in positive tap position. Cover location of handle entrance eliminates packing gland maintenance.



Threaded valve connections to tank are solder-wiped for extra protection. Valves are located for easy access. Globe-type valves with non-rotating seats close tight, avoid wear on valve seats.

Spiral-wound gaskets. Over 6 years' continual use has proved their superiority over other types of gasketing material for sealing bushings in the tank wall. Alternate plies of preformed spring-like metal and non-metallic fillers provide unusual resilience and actually adjust themselves to changes in operating conditions. Gaskets can be installed without cements or grease. They can be quickly removed if required and may be re-used if necessary.

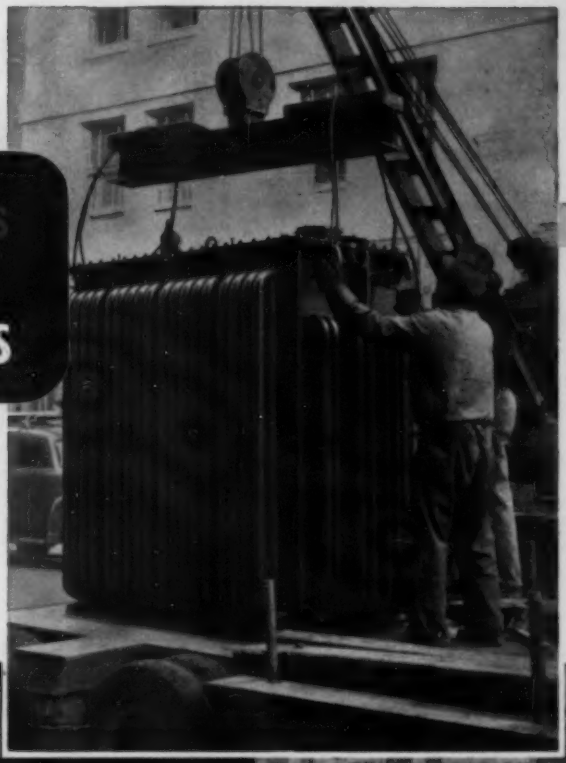
A-C ALLIS-CHALMERS

ALLIS-CHALMERS

TRANSFORMERS Expansion

ALLIS-CHALMERS

NETWORK TRANSFORMERS



MOVING NETWORK TRANSFORMERS TO VAULT in downtown Buffalo (right). Photo below shows how 750-kva network transformer fits into 500-kva vault, saving utility cost of reconstruction to meet increased downtown power needs.

Heating Cable Plus Ingenuity Equals:

Neat, De-Iced, Trouble-Free Refrigerator Doors, And . . .

Doors on walk-in freezers and cold storage rooms may be kept ice-free and easy to open through use of an electric heating cable. The first installation of this kind has been made at the cold storage plant, Alabama State Docks, Mobile.

Installed cost of the cable is only $100—much less than the bill for replacing doors and cork gaskets damaged in the hammer-and-chisel ice-chipping process.

Heating cable is run around the edge of the door frame. It is hidden by a facing plate made of stainless steel, brass, copper or even plastic.

Voltage varies with length of cable and size of door, but is regulated to feed 3 to 5 amp to the heating system. A thermostat switches on just enough power to melt ice or moisture clinging to the door edges. This amounts to about 300 or 500 w.

The first one was installed in 1953. Almost all doors of the cold storage plant now have the units.

FACING PLATE around the door frame spreads the heat evenly from heating cable run underneath it. Thermostatic control supplies enough heat to evaporate any moisture on the door. Cost of the installation is only $100—much less than former repair bills

. . . Workable Foundry Sand When Winter Closes In

Edwin L. Wiegand Co.

MOLDING SAND is prevented from freezing during winter off hours by electric heating cable. Sand is in usable condition when work is resumed and cable is removed. Each worker has 400-w cable 80 ft long

Warming sand piles with electric heating cables at the Lackawanna Foundry Co, Lackawanna, N. Y., prevents the molding sand from freezing in an unheated building, and eliminates caking during off-hours.

When workmen report for duty in the morning, they merely removed the heating cable. Because the sand is still workable, the men can go to work.

The sand is stored in an unheated building. Previously it was necessary to keep it warm with salamander stoves. Reconditioning the fine foundry sand in this manner involved extra labor, as well as a considerable loss of time. Furthermore, the salamander stoves produced foul fumes that made working conditions most unpleasant.

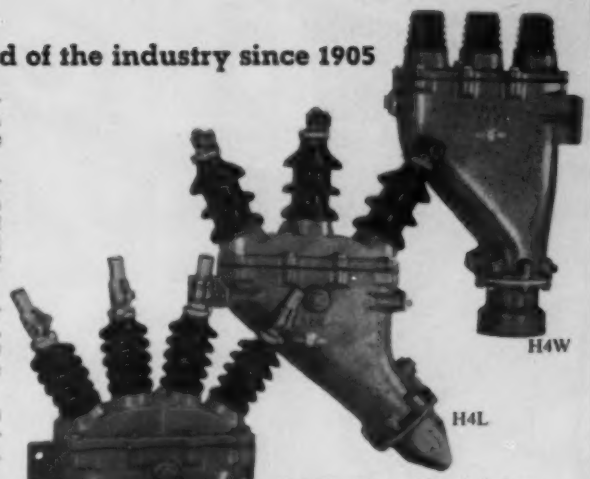
To solve the problem, the foundry's management provided each bench molder with one 400-w heating cable 80 ft long. The workman covers his pile of sand with it at the end of the day. In the morning, he removes it quickly and begins work,

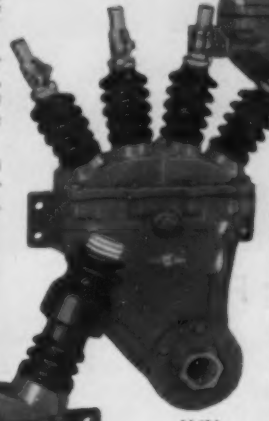
In addition to savings in time and labor, this electrical sand-treating method has yielded other benefits. Initial and operating costs are low, making it economical. Moreover, no further time or work is necessary to hold the sand ready for almost instant use.

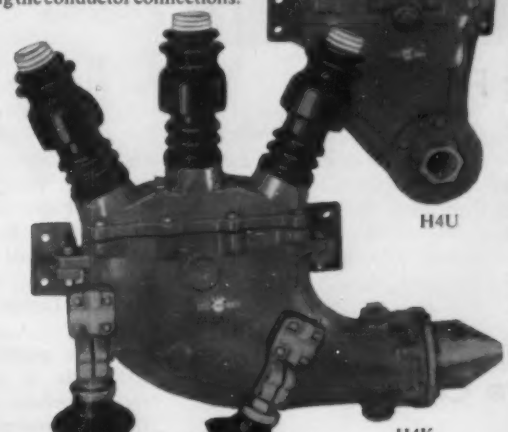
G&W

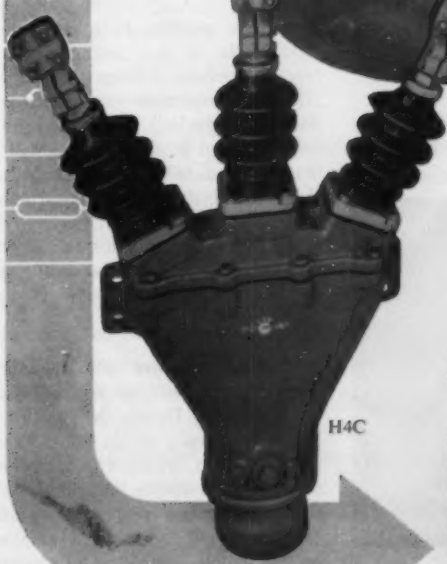
Recognized standard of the industry since 1905

- Seal cable ends against entrance of moisture which would seriously damage the cable insulation.
- Provide a compartment for surrounding the termination with insulating compound which improves the electrical strength over the surface of cable insulation.
- Seal cable ends against leakage of cable impregnating oil, loss of which would decrease the electrical strength of the insulation.
- Provide a neat support with means for conveniently making the conductor connections.









G & W offers stabilized designs of potheads for your own standardization, which minimizes your stock and simplifies your maintenance. Interchangeable parts are assembled in various combinations to take care of your different sizes and ratings of cables. Potheads of the correct type and size best suited to your requirements are shipped promptly.

Interchangeability of parts is illustrated by the five size "H" potheads shown. All five lids fit the five different shaped bodies. The base fittings all have the same size 4 flange. Porcelains and connectors are selected to meet the needs of voltage and conductor sizes. These size "H" potheads are only one of several groups which cover the full range of cables. Single conductor potheads are similarly assembled with interchangeable parts, many of which are identical with those for multiple conductor potheads.

Bulletin AB51 lists potheads in capnut, disconnecting and "through" styles, for all standard voltages and cable sizes. It includes part numbers and prices. Send for your copy.

50th ANNIVERSARY G&W 1905-1955

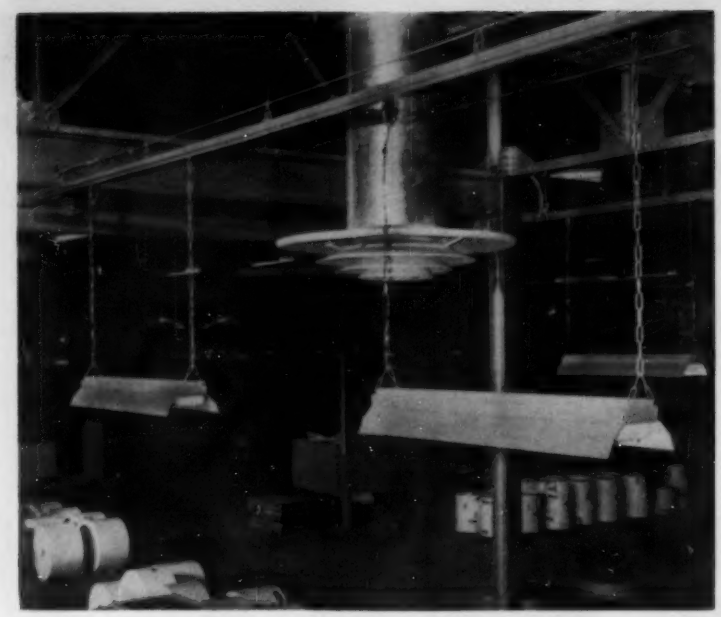
G&W ELECTRIC SPECIALTY CO.
7780 Dante Avenue, Chicago 19, Illinois

Representatives in principal cities of U.S.A.
In Canada—Powerlite Devices, Ltd., Toronto, Montreal & Vancouver

G&W

A548

And in Lighting . . .



Trolleys Build Lighting Flexibility

Flexible lighting system at new Lily-Tulip Cup Corp plant, Springfield, Mo., permits units to be moved to new locations, or additional units inserted where changes in manufacturing areas require higher lighting levels. Rows of lighting ducts are installed on 15-ft centers throughout the building. A fused twist plug attached to each luminaire is easily inserted into the duct for quick changes and additions. Lighting ducts are supported by ⅜- in. 7-strand suspension cable with ⅜-in. hanger rods suspended from the joists.

Lights and Fan Improve Cabinet Quality

Spray-varnishing and similar operations have been expedited by an exhaust fan and ample lighting in a special room built by Architectural Wood Manufacturers of New Orleans during a plant-expansion program.

Employee morale subsequently has improved, product quality has become better, and insurance rates have dropped because of reduced hazards.

Built of cinderblocks and protected by overload sprinklers, this fireproof "finishing" room is equipped with a 48-in. exhaust fan with automatically closing louvers. Powered by a 1-hp explosion-proof motor, it changes the room's air about three times each minute. Adequate lighting is provided by 300-w lamps in industrial type reflectors equipped with explosion-proof glass enclosing globes.

J. M. JENNINGS, JR, Industrial Representative, New Orleans Public Service, Inc, New Orleans, La.

LOWER INSURANCE rates, and better employee morale resulted when this spray varnishing room was made safe by electricity

INDUSTRIAL BRIEFS

Banks of fluorescent lights over areas where textiles are matched for color have decreased rejects 90% due to color mismatching for J. E. Morgan Mfg Co, Tamaqua, Pa. Illumination in the critical areas now is 100 ft-c; formerly it was 35. Clare J. Long, Industrial Representative, Pennsylvania Power & Light Co, Pottsville, Pa.

Limit switch triggers a bell alarm which warns workmen not to change load on platform scales of State Metals & Steel Co, Canton, Ohio. This eliminates damage to the weight-printing mechanism that occurs when loads are changed while it is working. The limit switch is actuated by the control handle of the printing mechanism. H. T. Fessler, Industrial Power Engineer, Ohio Power Co, Canton, Ohio.

The Air Force has installed electric plug outlets on each of the 40 parking lanes at its parking pool, Duluth Air Force Base. Each motor vehicle has a 650-w immersion heater in the cooling system. Cars are plugged in while parked. Freeze-ups, worn-down batteries and starting failures have been eliminated. Fred E. Stout, Industrial Sales Engineer, Minnesota Power & Light Co, Duluth, Minn.

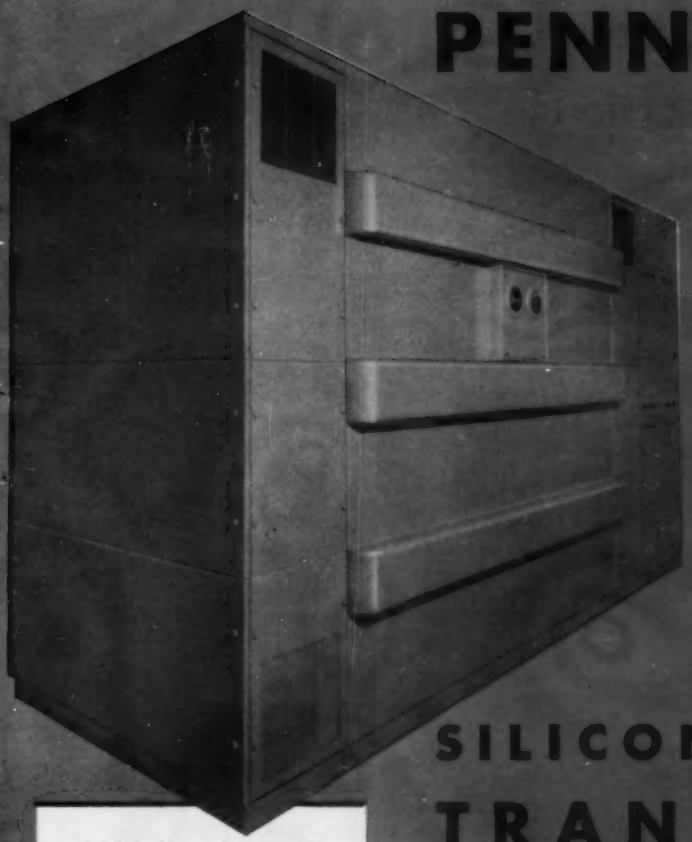
Automatic grinding to tolerances of 0.00005 in. is now being done at North American Phillips Co, N. Y., after the installation of an "Electro-Autosizing device". Taper and form are controlled by the robot as well as the tolerance. When the piece is machined to instructions, the grinding wheel retracts automatically. Semi-skilled labor can monitor the device, thus freeing master mechanics for tool and die making. Industrial Gauges Corp, Englewood, N. J.

A fuel oil preheater with automatic temperature control has enabled Katz Underwear Co, Honesdale, Pa., to use No. 6 low-grade oil in its building heating system. Preheating has raised the fuel's heat-output. Previously this grade oil atomized improperly on cold days, backfired, endangered employees. Charles C. Millar, Industrial Representative, Pennsylvania Power & Light Co, Wilkes-Barre, Pa.

PENNSYLVANIA

suggests you consider

Fire and Explosion resistant



2000 Kva Group 3 Sealed-in Nitrogen Dry Type Transformer. H. V.—2400Δ volts. L. V.—480Δ volts. Three Phase. One of the largest Silicon-Insulated transformers ever built.

SILICONE-INSULATED TRANSFORMERS for Indoor Unit Substations

When planning an indoor unit substation, plan to install the safest substation transformer ever developed — a Pennsylvania Silicone-Insulated, sealed-in-nitrogen 150°C. Rise Dry Type Transformer.

Since oil-filled transformers constitute a fire risk, they cannot be used safely indoors unless expensive vaults and barriers are erected. And though askarel-filled transformers are installed indoors without vaults or fire barriers, they have been known to give off toxic HCl vapors under arcing. This constitutes a hazard to personnel. Therefore, Askarel transformers must be provided with gas absorbers or they must be vented to the outside air.

Pennsylvania Silicone-Insulated Transformers can be installed indoors "as is", without expensive vaults and other costly safety devices because inherently, they are the safest transformers ever developed. But safety is only one of their many advantages, for these "safest" dry type transformers also feature *smaller size, greater overload capacity, decreased cooling time, resistance to dirt and moisture, and minimum requirements for maintenance.*

If you want to know more about the Pennsylvania Silicone-Insulated Transformer — formerly called Class H — see your Pennsylvania representative or write to Pennsylvania Transformer Company, Box 330, Canonsburg, Pennsylvania.

PENNSYLVANIA TRANSFORMER COMPANY

A McGraw Electric Company Division · CANONSBURG · PENNSYLVANIA

pt

PG&E Goes After Electric Heating Load . . .

With ads, billboards and enclosures . . .

By briefing personnel in advance, and . . .

With window displays of equipment

When Pacific Gas & Electric Co said it would promote electric heating this year (EW, Dec. 6, p 50) it meant PROMOTE. Right now the big West Coast combination utility is engaged in one of the most comprehensive electric heat sales campaigns the industry has yet seen.

Kicked off only a few weeks ago, the campaign already can point to results. For example, one building contractor has decided in favor of complete electric house heating for a 52-home first unit of a subdivision he's developing in Willits, Calif. These homes will be all-electric, including 10.83 kw of heating load per residence and wired-in circuits for ranges and water heaters. To make the story even better, this electric heating job was sold in competition with LP gas.

Emphasis throughout the campaign is being placed on completely electrified heating in new homes plus 240-v supplementary and auxiliary heating. A big reason for this electric heating push is PG&E's ample margin of capacity and energy. Another: With peak energy use and demand coming in the summer, electric heating, it feels, offers an ideal compensating wintertime load.

To carry it out, it has put a three-pronged program into operation:

1. An all-out consumer and trade advertising schedule using a variety of media such as 24-sheet posters and truck banners; media usually reserved by most utilities for their better established load-building devices.
2. Employee and contractor dealer training programs.
3. Electric heating merchandise displays in company offices.

As part of the January kick-off, full-page ads were run in two regional consumer and trade magazines. In both publications, several manufacturers of electric space heating equipment tied in with their own ads. During January bill enclosures in color were mailed to more than a million customers, while 2,500 company trucks carried electric heating banners. Scattered throughout the service area

(*Continued on page* 132)

"WILL IT PAY US TO USE ALUMINUM CONDUCTORS?"

Simplex CAN TELL YOU ...WITH AUTHORITY...

Now that the furor over the use of aluminum in wire and cable has died down, it is possible to look at this conductor metal dispassionately and see where it will best serve you.

One of the important things to remember about aluminum is that it is merely another conductor material. It has advantages and disadvantages just as copper has. These advantages and disadvantages must be weighed carefully to be sure you get the conductor material you want. That's where Simplex speaks with authority. Our experience with aluminum covers a period of more than 30 years.

Regardless of the conductor material, there is another phase of cable construction you shouldn't overlook. That is the insulation. It is here that Simplex's 70 years of experience can save you money by suggesting the best materials and design for your job.

Why don't you write today, outlining your problem, and let us make suggestions?

Simplex WIRES & CABLES

SIMPLEX WIRE & CABLE CO., 79 Sidney Street, Cambridge 39, Mass.

Pioneers in Research on Wires and Cables Since 1889

PG&E's Electric Heat

(*Continued from page* 130)

(about 89,000 sq. miles) are 350 24-sheet outdoor billboards, all telling the electric heating story.

A non-technical booklet is being offered to all PG&E sale personnel, electrical dealers and customers.

Educational Program Basic . . . But basic to this promotion, believes PG&E is the educating of its employees and electrical contractor-dealers on the sizing and installation of heating equipment. For this job there is a specialist in each of PG&E's 13 divisions. These specialists have been thoroughly briefed on technical and promotional aspects of the program. They conduct meetings with employees, work with contractors and dealers to stimulate point-of-sale activity, and maintain continuous contact with architects and consulting engineers.

To show case the equipment for the consumer, PG&E district offices turned over their display areas entirely to electric heating throughout January. Displays were arranged for and exhibited by local dealers.

Cooperative Venture . . . PG&E's policy is to cooperate with manufacturers, distributors and dealers in the sale of established electric space heating equipment, but it will not be responsible for the engineering of residential heating layouts.

Only upon request will its own electric heating specialist check a customer's heating plant for proper sizing and placement of heating equipment. It will recommend only those jobs which are properly sized, located, thermostatically controlled and adequately insulated.

As an added help to this promotion, the company has the aid of several banks (465 including branches) who will finance home rewiring either "in package" with appliance sales, or in straight time payment jobs.

Pushes Package Wiring

Minnesota Power & Light Co is launching a package plan rewiring program in Duluth similar to one in Minneapolis-St. Paul. (EW, Jan. 24, p 202). North Central Electrical League, sponsors of the plan in the Twin Cities, is helping to set it up.

TRIAL FLUORESCENT SYSTEM along one block (foreground) of Dallas' Main street paved way for re-lighting 10 blocks of business section. New lights will shed 60% more illumination

Dallas To Put in Fluorescents

More fluorescent street lights are in the works—this time in Dallas, Tex. where new units are expected to put 60% more light along 10 blocks of downtown business district.

Decision to use fluorescents followed tests on a one-block experimental installation of five lights installed last October (see picture). City had considered new street lighting for some time, prompted by the need for better traffic safety and a desire for civic improvement. Besides this, the old standards were obsolete and becoming too expensive to maintain.

Installation will consist of 101 ornamental standards with 21,000-lumen fluorescent fixtures. Each fixture will contain four 6-ft.-long tubes. Mounted at 30-ft heights, they will shed an average 1.5 ft-c on the street surface.

How will costs compare? Dallas figures that while the costs of the new units are $800 each (compared with $500 for the old-style type) the difference in number required makes the fluorescent lights comparable in cost. Fluorescent tubes last about two years while the old-style globes last only about nine months. Operating costs will run about $4,500 more than the old ones. But it is felt that added cross-street lighting gained plus greater illumination more than offset this. In the experimental installation, operating costs for both types were about even.

Dallas Power & Light Co, under its contract with the city, will buy and install the new lights at a cost of $76,-710. City will pay an annual charge on an investment and replacement basis. J. W. Monk, Dallas utilities supervisor, says the new system will lead the way to the eventual relighting of the entire downtown district.

Heater Gets Glamor

Even water heaters are getting the beauty treatment. A non-cylindrical shape and aqua-colored front panels feature new water heaters just introduced by Permaglass Division of A. O. Smith Corp. The new design was developed to bring the water heater out of the cellar and into the upstairs kitchen-utility rooms. Electrical models use wrap-around heating element of aluminum-clad steel with notched flanges for flexibility.

Electric Heat in Penn?

Look for electric companies in Pennsylvania to take a more active interest in electric space heating and the heat pump. Members of Pennsylvania Electric Association's Residential Committee met in Harrisburg last month to hear manufacturers and dealers outline ways and means of promoting and selling it. A. J. Smalley of Duquesne Light Co set up program.

Give the Guy a CHANCE

When anchor users make a study of earth anchors—make their own pull tests for holding power—make their own comparisions . . . we're happy, because the Chance 8-Way almost always takes top position for holding power and ease of installation.

Such tests prove that the 8-Way holds far more than its rated load because its *eight* blades expand to form a complete pyramid shaped square—there is no wasted space between blades. The guy load is distributed to all *eight* blades all the way around the hole.

Chance 8-Way Anchors are available in sizes from 60 to 200 square inches in area, for distribution and transmission line guying. Your Chance Anchor Distributor can supply you from stock. *Specify Chance for Service!*

MIKE THE MOLE SAYS:

"Man, this book can help you 'dig' anchors better. GET YOUR COPY TODAY."

CASS-4

Here is the most complete guide to better anchoring ever developed. It's chock full of how-to-do-it material to help you select the right anchor for every guying job—and install it properly. It's FREE!

A. B. CHANCE CO. • 205 N. ALLEN ST. • CENTRALIA, MO.

O.K. Have "Mike" send us_____copies of "ANCHORING"

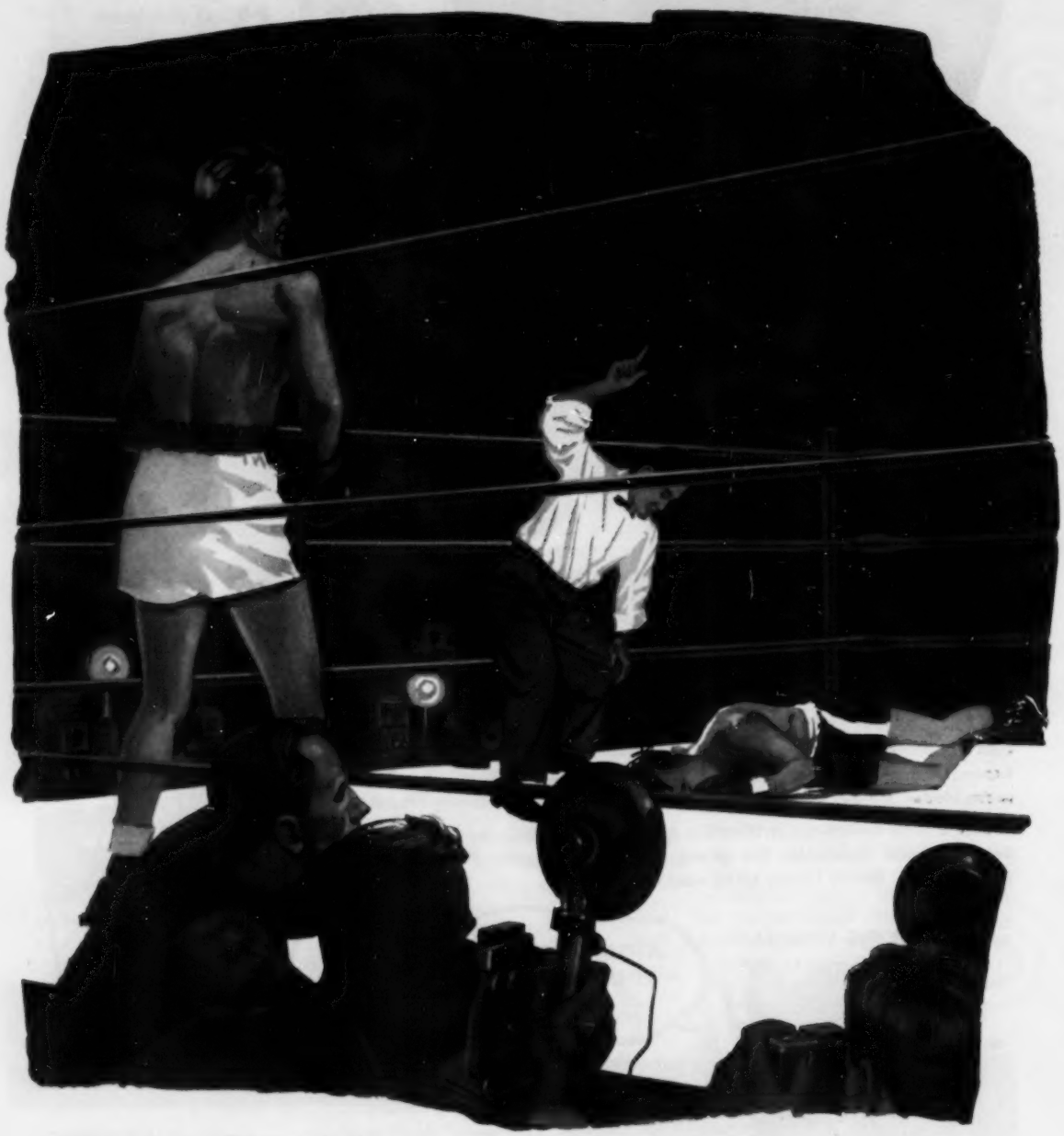
NAME_____

COMPANY_____

ADDRESS_____

CITY & STATE_____

*COMPETITIVE TESTS PROVE



THE SUPERIORITY OF PINCO "UNIVERSAL" INSULATORS, TOO!

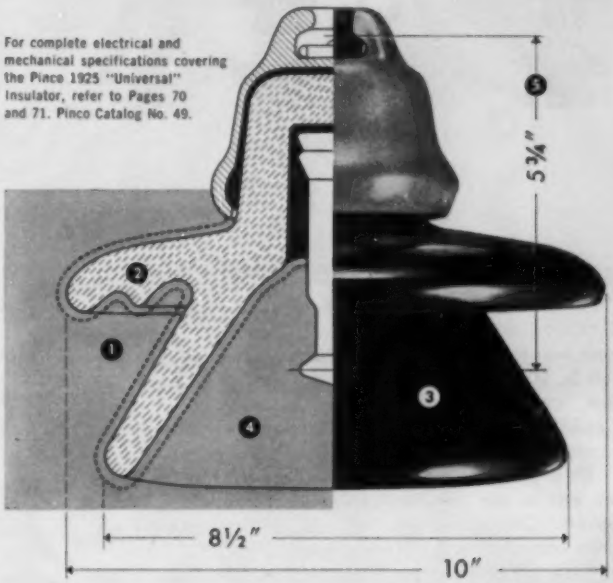
for 25 years—proved the right insulator for the job in areas where excessive contamination is a constant operational hazard.

Fog, salt spray and fly ash are dirty fighters! And the only insulator that can win is the insulator that *protects itself at all times.* The Pinco 1925 "Universal" is such an insulator. During the past twenty-five years, many "fog type" designs have been tried in many sections of the country, under the severest operating conditions. And in *every* test, Pinco "Universals" have proved themselves on all counts. Yes, Pinco "Universals" enter the fray favored to win! Here's why:

❶ Leakage distance is a big 17"—approximately 50% greater than a standard 10" suspension unit. ❷ The upper shell being a larger diameter (10") protects the lower section (8½" diameter) from cumulative rain drip—thus providing effective leakage distance. ❸ The hood . . . long, tapered and self-cleaning . . . acts as a spatter baffle to clean the petticoats. ❹ In strings, the interior of the hood is shielded by the unit below . . . to lessen contamination and need for manual cleaning. ❺ Standard 5¾" spacing permits replacement of standard 10" suspension units without re-sagging.

On their record . . . on "form" (design) . . . Pinco 1925 "Universals" are a "sure bet" to WIN . . . for YOU!

For complete electrical and mechanical specifications covering the Pinco 1925 "Universal" Insulator, refer to Pages 70 and 71. Pinco Catalog No. 49.



***Here is how Pinco 1925 Insulators rated in a competitive "fog operation" test conducted by a western utility . . .**

FIRST	on "fog arc over"	**FIRST**	on both self-cleaning and manual cleaning characteristics
FIRST	on sustained voltage "in fog" . . . no arc over	**SECOND**	on "sluice arc over"
FIRST	on sustained voltage "in direct spray" . . . no arc over	**EXCELLENT**	on radio interference characteristics

PINCO INSULATORS

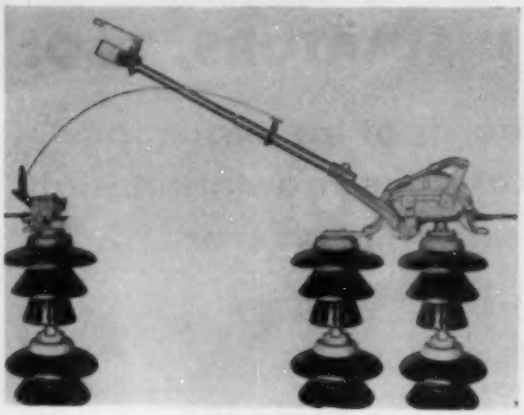
1920 35 1955 YEARS OF SERVICE TO THE ELECTRICAL INDUSTRY

If you are now faced with a contamination problem and wish more information regarding the Pinco 1925 "Universal" Insulator—then drop us a line or contact the Joslyn Mfg. & Supply Co. office in your locality.

The Porcelain Insulator Corporation
LIMA, N. Y.

Suspension Insulators . . . Clamps and Fittings . . . Distribution and High Voltage Pin Types . . . Guy and Tree Insulators . . . Switch and Bus Insulators . . . Special Porcelain.

NEW EQUIPMENT



Interrupter

Hi-Velocity interrupter attachment permits conventional gang-operated disconnect switches to switch capacitive currents and interrupt transformer magnetizing currents up to 15 amp. The unit consists of a tapered, stainless-steel rod with clamp for fastening to switch-arm, a stationary contact catch, and a dampener with fastening clamp. As the switch-arm is raised, the end of the rod is restrained by a catch until the arm moves beyond the safe open-gap distance. The rod is then released like a "slingshot" and springs upward so fast that an arc cannot occur.

The interrupter is said to assure certain operation under adverse conditions caused by rain, snow, sleet or ice.

Hi-Voltage Equipment Co, 400 E. 116th St, Cleveland 5, Ohio

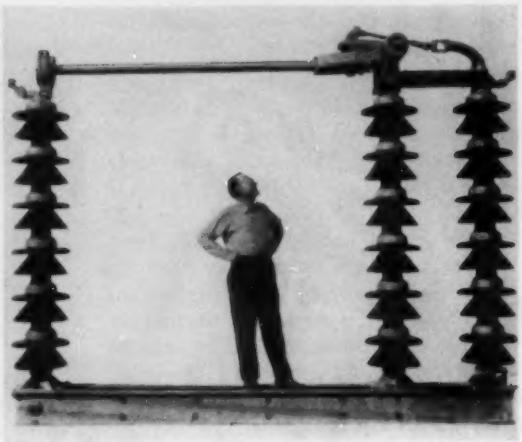
Disconnect Switch

Twist-blade, vertical-break disconnecting switch rated 230 kv, 1,200 amp is easily operated through a double-gin-pole mechanism. The rear insulator stack of the type GT-22 is rotated to open and close the switch. Design of the blade operating mechanism includes two positive "locks" which hold the blade securely inside the jaw contact.

High pressure, line-type contacts are used in the hinge as well as the jaw thus elminating the use of braided shunts. Current-transfer materials in these contacts are pure coin-silver and bus-bar copper.

Type GT switches are available from 7.5 kv and 1,200 amp.

USCO Power Equipment Corp, Box 629, Birmingham 1, Ala.



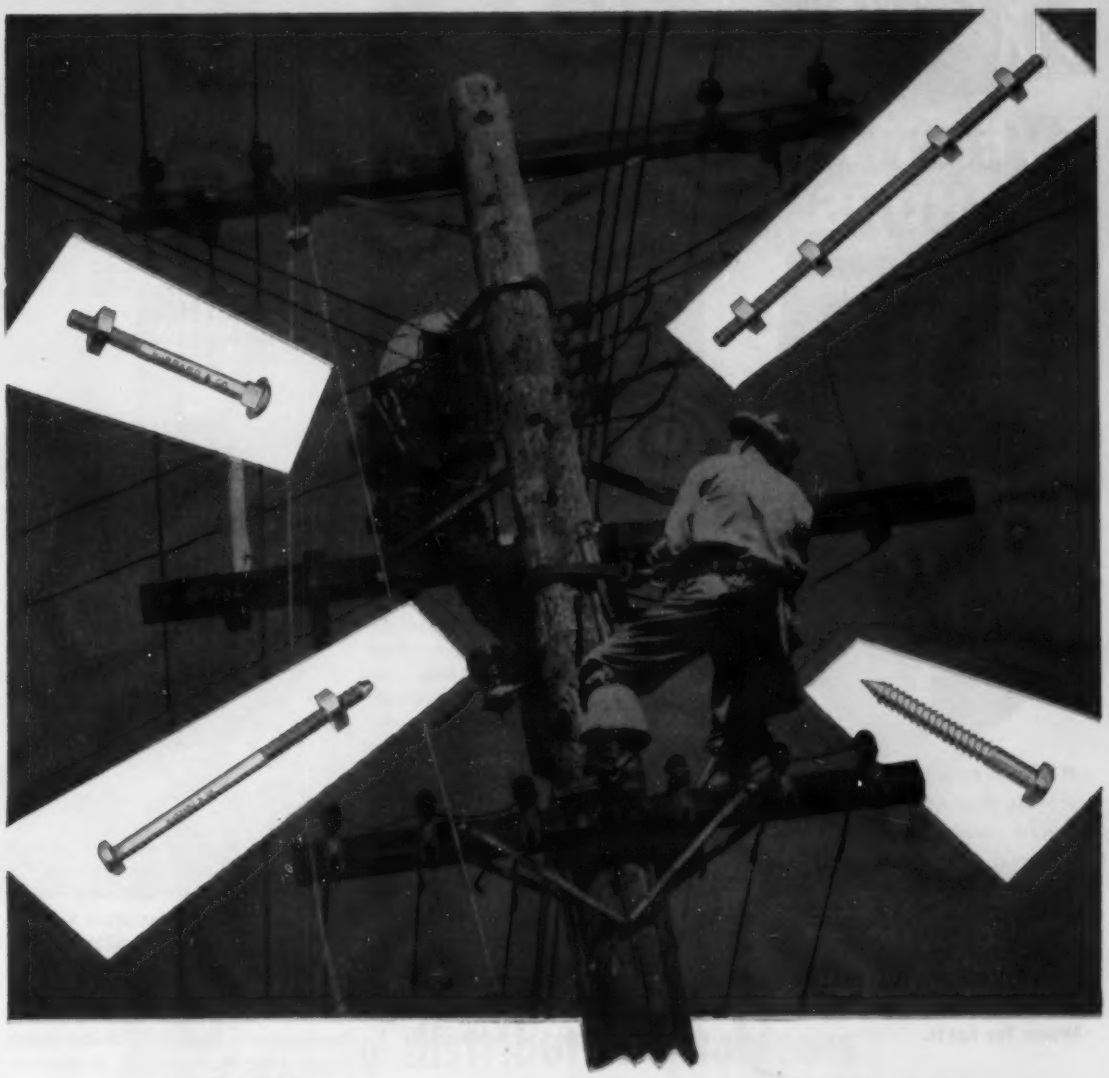
Hydraulic Derrick

Setting up a derrick unit on a truck is accomplished automatically with the Hydraulic Derrick. Designed to handle power, light and telegraph poles, the unit operates from a power take-off and hydraulic pump. An extension tube enables the derrick to handle any size pole used on electric utility and communication systems.

When not in use the derrick structure folds compactly on the top of the truck. Operation of a hydraulic valve unfolds the structure for use at the back of the truck.

Standard Trailer Co, 415 San Leandro Blvd, San Leandro, Calif.

HOLD EVERYTHING!



with HUBBARD Hardware

Machine bolts, carriage bolts, double arming bolts, and lag screws—the workaday items of the electrical industry—are specially designed by Hubbard with careful attention to the functions which they must serve.

All crossarm and double arming bolts have the original Hubbard DRIVEPOINT feature. All bolts and lag screws are formed from new open hearth steel and are Hubbard Double-Dip Hot Galvanized. Special care is used to keep threads clean and smooth during galvanizing.

If it's Hubbard, it's made to serve efficiently.

HUBBARD AND COMPANY

ESTABLISHED 1843

PITTSBURGH • CHICAGO • OAKLAND, CALIFORNIA

"Hang the Load on Hubbard Hardware!"

The Old Reliable

EVERSTICK ANCHORS...

EXTRA Holding Power

QUICKLY Installed

TOUGH For long life

● They speed up work and provide dependable anchorage in new construction and maintenance. Quick and easy to install—made of tough rust-resistant malleable iron—their holding power "tops" all others. Available two-way, three-way, four-way, and cone types. Write for facts.

Exclusive Everstick nut housing. Locks anchor firmly on rod. No chance of rod slipping thru anchor.

EVERSTICK ANCHOR CO.

Manufacturer of "THE ANCHOR OF MERIT"

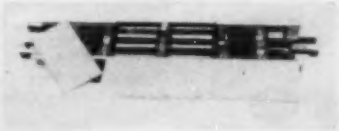
FAIRFIELD, IOWA

Breaker Closing Device

Packaged power operator for closing oilless circuit breakers in metal-clad switchgear operates independently of regular source of control or closing power in stations. The portable device will close all current designs of magne-blast circuit breakers in the interrupting range from 100 to 750 mva. Liquid carbon dioxide serves as the source of closing power for the "Cooperator" closing device.

Stored energy is contained in a standard 10-lb bottle of carbon dioxide. Gas to close the breaker is released from an intermediate receiver by control valve. Up to 75 closing operations are obtained from a standard bottle of liquid carbon dioxide. A power cylinder and piston for closing the breaker are arranged to be placed under the breaker closing solenoid plunger.

General Electric Co, Schenectady 5, N. Y.



Bus Duct

Adjustable straight length of bus duct can be lengthened or shortened on the job by as much as 6 in. The new fitting permits flexibility in placement of fixed apparatus and simplifies connections to apparatus already in place. Standard 5 ft lengths of plug-in bus duct are continuously adjustable from 4.5 to 5.5 ft and 6 ft fittings for low-impedance indoor bus duct adjust from 5.5 to 6.6 ft.

Plug-in duct fittings are rated up to 1,500 amp in copper and 1,000 amp in aluminum. In ventilated enclosures, indoor low-impedance copper fittings are rated to 3,000 amp; when totally enclosed, to 2,250 amp. Aluminum fittings are rated to 1,600 amp. Fittings are rated at 600 v for two or three-wire units. Four wire units are rated at 277/480 v and are available with either half or full neutral.

Westinghouse Electric Corp, Box 2099, Pittsburgh, Pa.

Meter

Elapsed time meter with 5-digit registers reads total hours or tenths of hours. The surface mounted instrument operates on commercial voltages and frequencies. It is available in 2.5 and 3.5 in. sealed bakelite cases conforming dimensionally to MIL specifications.

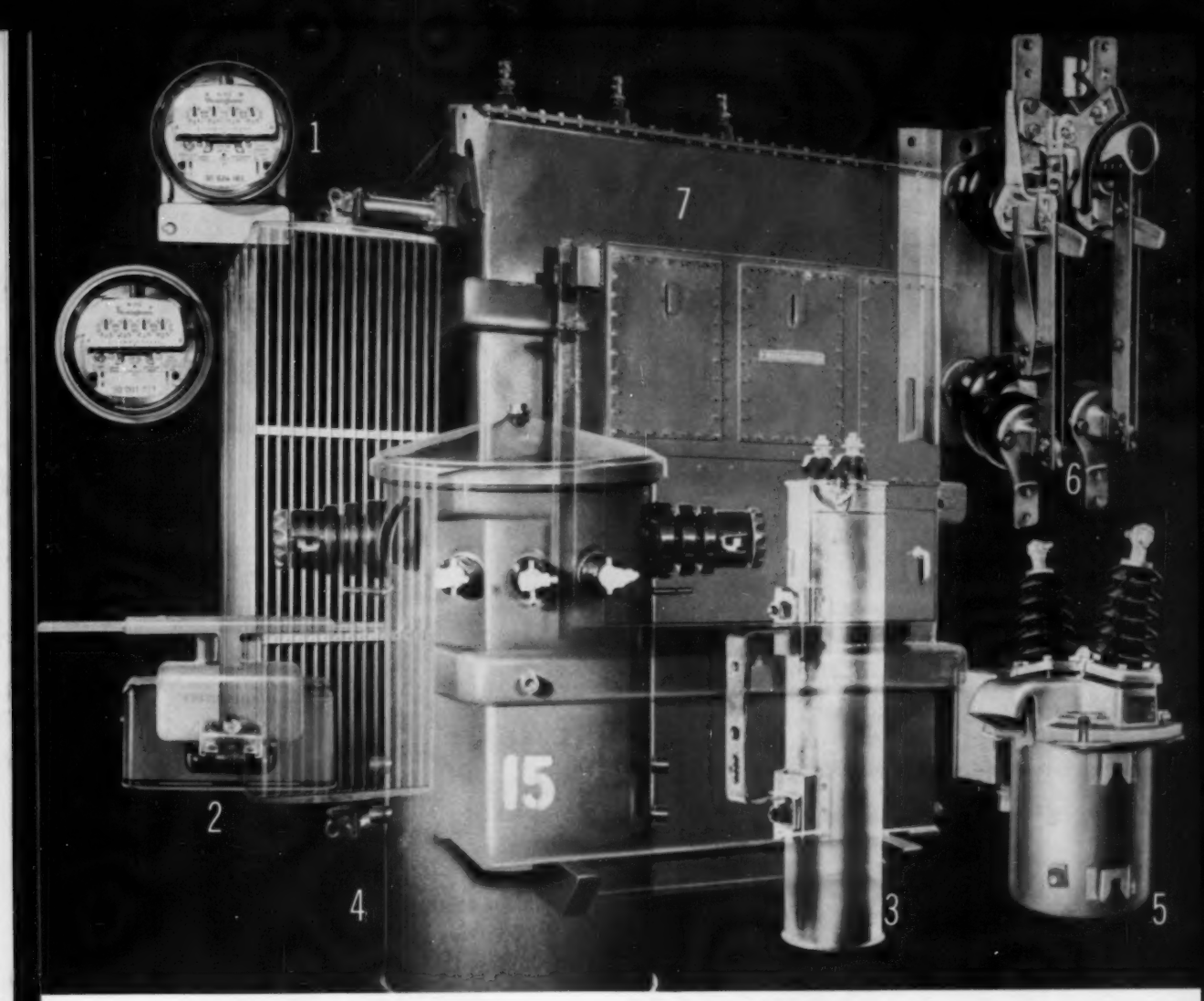
Instrument Division, Roller-Smith Corp, 1755 W. Market St, Bethlehem, Pa.

Totally-Enclosed Motor

Same horsepower in less space is provided in a new design totally-enclosed motor. The Type J motor is designed for operation in fumes, dust and moisture. It is claimed that greater protection is provided by improved design and manufacturing methods. No general disassembly is required to gain access to bearings.

Frame is ribbed for rapid heat dis-

(*Continued on page* 131)



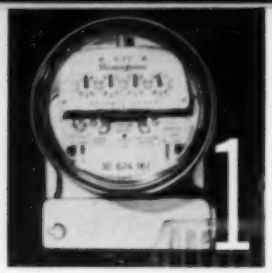
7 new products...7 new solutions to distribution problems

Today, one of the most important areas of utility operation is distribution. A constant stream of new ideas and new developments is needed to help solve the problems arising from ever-increasing loads—ever-greater system demands.

Here, L. L. Wrentmore, Westinghouse Distribution Apparatus Manager, presents seven new products that represent the solution to many of these problems.

YOU CAN BE **SURE**...IF IT'S

Westinghouse



New *Lifetime* meter . . . for long life, low-cost metering

Westinghouse has designed the Lifetime meter to measure all foreseeable single-phase loads. This new meter design has coordinated the latest materials and processes to assure you of accurate, long life, low-cost metering. The five basic factors of economic metering are:

1. **Range**—Sufficient load range to take care of present and future loads.
2. **Thermal Capacity**—The ability to give good service and long life at extreme temperatures and high overloads.
3. **High Insulation Level**—The ability to withstand high-voltage surges without damage.
4. **Stability**—Meter is inherently stable mechanically, electrically and magnetically to provide long-time accuracy.
5. **Corrosion Protection**—All materials and finishes are selected and coordinated to give maximum protection against corrosion for long life and low maintenance.

The new Lifetime meter gives you *all five* factors to answer your needs in measuring "America's greatest bargain"—economically.

R. A. Warren, Manager of Meter Sales, with the new Lifetime DS & DA meters.

Bob Hurst, Sales Manager, Instrument Transformers, shows new molded construction of the SM-5 transformer.

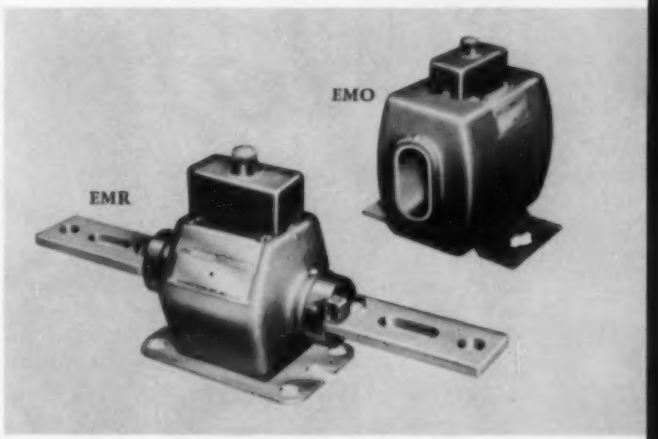
New instrument transformers . . . molded design improves performance, extends life

Westinghouse instrument transformers, types SM-5, EMR and EMO, have been designed with new molded construction for greater thermal and dielectric stability, better accuracy and longer life.

The SM-5 is a 5-kv indoor current transformer which is silicone insulated throughout. It is smaller, lighter, yet more durable than any similar unit.

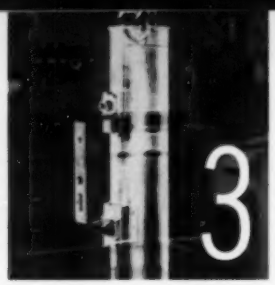
Types EMR and EMO are outdoor-indoor current transformers for 600-volt service. The EMR is a miniature unit featuring a round primary opening with or without removable primary terminals. The EMO features an obround primary opening for use with multi-cable primaries. Both are molded with a new polyester elastomer insulating material that is more weather resistant than any material ever used for this purpose.

All three offer complete installation flexibility and may be adapted to virtually any type of mounting. They are in stock, ready for prompt delivery and long, dependable service.



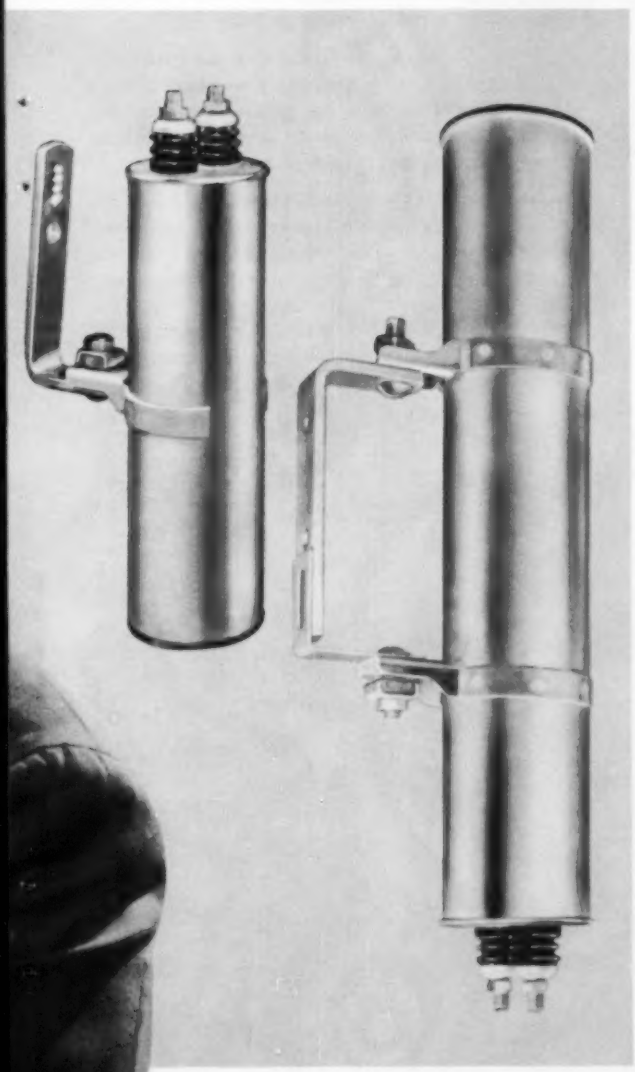
Types EMR and EMO current transformers for 600-volt service.

YOU CAN BE SURE...IF IT'S Westinghouse



Ralph Marbury, Manager of Capacitor Engineering, with the new 7½-kvar capacitor.

New 7½-kvar capacitor... lower cost kilovars



The rapid increase of inductive loads on secondary circuits is creating problems of low voltage and overloaded transformers.

Under these conditions, Westinghouse can give you an important assist with secondary capacitors, at appreciably less cost than with other methods. Utility studies show capacitor costs are often ½ to ⅔ the cost of transformer capacity released for new load.

Let's take a closer look. Specifically for relief of transformers, these capacitors can:

1. **Release transformer capacity**
2. **Reduce secondary line losses**
3. **Improve voltage**

The new 7½-kvar, 240-v capacitor now joins the 3 and 5-kvar units to give you a complete line of Westinghouse secondary capacitors. They offer low original cost, with reduced installation and maintenance expense. They have 16-gauge extruded aluminum tubular cases and weigh 40% less than competitive units. One man can carry these units up a pole and install them in a few minutes. The case will never rust or need painting. Silicone-rubber bushing gaskets are impervious to Inerteen®, and are not affected by extreme temperature changes.

Westinghouse developed the 7½-kvar capacitor for higher rated transformers. The length of this unit is the same as the 5 kvar and only slightly larger in diameter. Two 7½-kvar capacitors, for example, now service a 37½-kva transformer, replacing four 3-kvar or three 5-kvar units. Extending the economies of capacitors, you now have fewer to hang—new savings in cost per kilovar.

The Westinghouse proved-in-service, 3 and 5-kvar capacitors can be mounted with bushings either up or down, bolted to the pole or mounted on the crossarm with a standard EEI-NEMA bracket.

YOU CAN BE SURE...IF IT'S Westinghouse

New distribution transformers . . . from smallest to largest ratings

Here's a new standard for transformer dependability: the new Westinghouse pole-type distribution transformer, *completely* redesigned in all ratings from 3 to 167 kva.

This is the transformer *you* helped design. As a result it has the features you want—solves the problems that plague you in the field. For instance . . .

Corrosion—The new design eliminates all water-collecting surfaces, moisture-entrapping seams and crevices, corrosion-vulnerable hardware. How? Through the dome cover with its unique single retaining bolt, internally clamped bushings, projection-welded hanger lugs, rolled tank bottom and exclusive 3-coat Coastal Finish.

Sealing—Corprene gaskets on both bushings and cover are sealed and retained. The dome cover design actually increases gasket pressure 250%.

Installation—Reduced height of wall-mounted bushing designs, 25 to 50 kva, permits change-outs to higher ratings on existing poles. The new tap changing device is fast, easily accessible. Bushing terminals take either copper or aluminum.

Operation & Maintenance—These are some of the features that make for better operation and easier maintenance: redesigned core and coil, improved core gap processing, ValvEX arresters, single cap bolt and wrap-around end frame.

Yes, for every problem there's an answer in this Westinghouse transformer. Feature for feature, dollar for dollar, there's nothing to equal it.

YOU CAN BE SURE...IF IT'S Westinghouse

. . completely redesigned inside and out . . .

R. N. McCollom, Sales Manager, Transformer Division, shown with production line of redesigned transformers.

Bob Lawrence, Distribution Apparatus Product Engineer, points out the application of the LP switch.

New LP switch solves "cold load" pickup problem

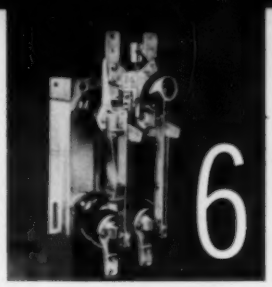
Write off another distribution headache—picking up an urban or suburban circuit following an outage.

The new Westinghouse load pickup switch substitutes automatic load shedding and restoring for the undesirable practice of relay blocking or manual line sectionalizing.

The LP is a 200-ampere switch suitable for all voltages, 2.3 to 15 kv. It automatically sheds the load it controls following a 2-minute loss in system voltage, closes to pick up that load with adjustable time delay of up to 5 minutes following restoration of voltage. Properly located, a set of LP's will shed ⅓ to ½ of the load on a distribution feeder breaker, allowing it to pick up the load in easily handled increments.

The advantages? Eliminates costly manual sectionalizing of faulted circuits, giving fast, positive restoration of service. Permits lower relay settings on breakers, resulting in improved fault sensitivity and less chance of conductor burn-down.

The steady growth of loads and the greater use of automatically controlled appliances point up the importance of this new Westinghouse development.



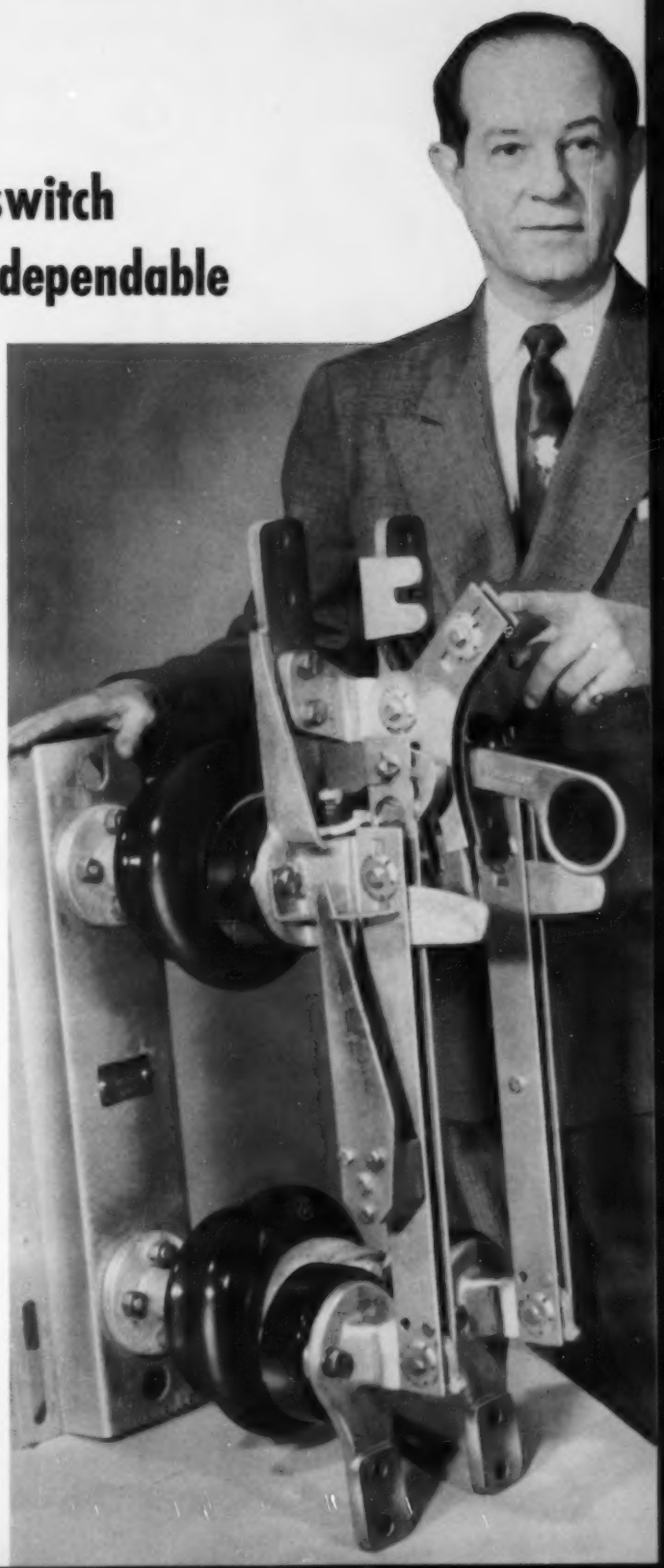
6

New regulator bypass switch simpler, sturdier, more dependable

The new Westinghouse RBO switch has all the features that have made the LCO line of outdoor switches so successful for years. Multiple-line contacts on the main blades are silver-to-silver, high-pressure type which will carry full capacity yet open easily. Double-blade construction provides increased contact pressure under short-circuit conditions because magnetic action draws blades together. The switch is sturdily constructed throughout, using annular ring hinge contact, bent-plate steel base and extra-large hook eye.

There is no possibility of operator error with the new Westinghouse type RBO regulator bypass switch because proper switching sequence is built in and is automatic. The mechanical arrangement between the main blades and the bypassing blades insures proper sequence of operation. Since there is but one hookstick-operated eye for isolating or restoring the voltage regulator, there is no question as to which switch to pull first.

The new switch is recommended for bypassing regulators because it prevents costly errors. As an extra dividend, however, it also will save space, reduce structure size, economize on construction and installation costs, reduce conductor length and simplify connections.



Wilbur Pyle, Sales Manager, Switchgear Devices, points to the bypass blade arrangement of the new RBO switch.

YOU CAN BE SURE...IF IT'S

Westinghouse

J. C. Rissinger, Manager of Small Power and Equipment Transformer Sales, points to Westinghouse mobile substation.

Mobile substation . . . key to a

Westinghouse mobile substations like this make possible a new look in distribution substation design. With a completely mobile substation available to carry the load during routine maintenance outages, it becomes entirely practical to combine the usual substation equipment into a package design with resultant higher efficiency, lower installation costs and reduced maintenance. As an example, single-phase transformers with separate regulators can be replaced by standardized 3-phase transformers with integral tap changing underload or "CSP®" power transformers.

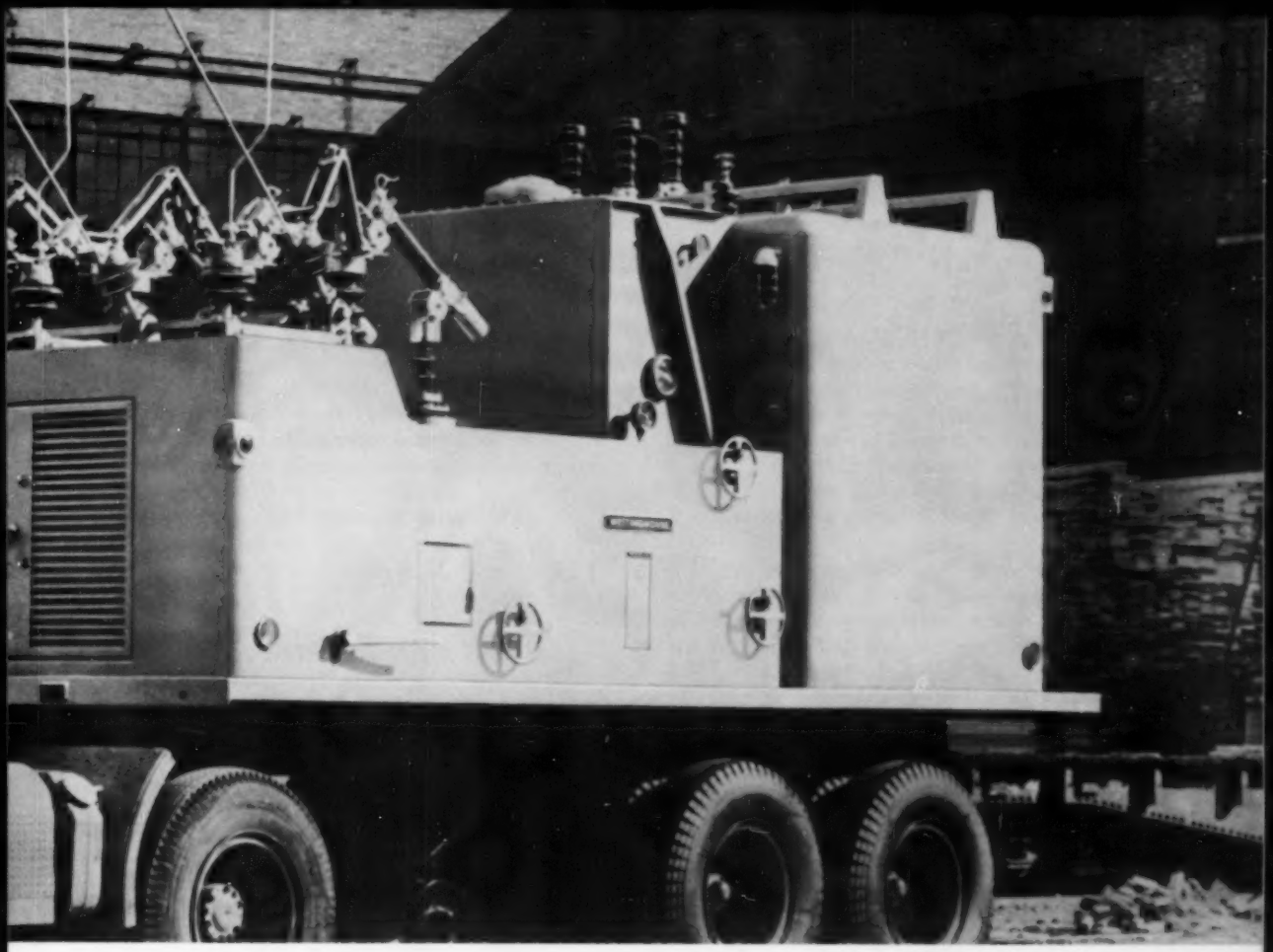
Westinghouse transformers with built-in tap changing underload give you the maximum economic benefits of standardization. For instance: simplified purchasing and engineering; lower initial cost and faster delivery; easier installation; simpler operation and maintenance; and, finally, lower spare parts inventory.

Westinghouse "CSP" power transformers provide the ultimate in simplicity and reliability with still further savings. Their pleasing appearance and low sound level make them welcome "neighbors" in highest class residential areas, thus simplifying your problems of substation site procurement. These compact units combine a 3-phase transformer with integral tap changing underload, secondary switchgear, and all protective equipment in one streamlined package.

Westinghouse has constructed highway mobile transformers as large as 20,000 kva and in voltages as high as 115 kv, and railway mobile transformers as large as 83,333 kva at 220 kv, complete with tap changing underload. The lightweight of the "Form-Fit" design makes possible these higher kva substations within highway limitations.

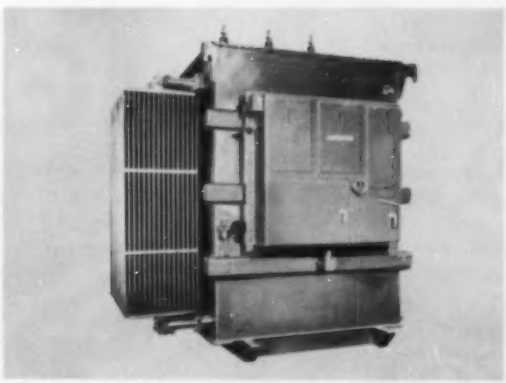
When you plan your new distribution substation, investigate the savings available to you through the use of packaged equipment and mobile substations.

YOU CAN BE **SURE**...IF IT'S



new look in substation design

Contoured-design "CSP" single-feeder unit substations combine all the advantages of equipment coordination with outstanding appearance and safety. They make wonderful "neighbors" in residential areas.



"CSP" power transformers represent the ultimate in equipment coordination for single-feeder substations. Compact, attractive, quiet, safe, "CSP" power transformers are ideal for residential and commercial areas.

Westinghouse

Westinghouse design engineers match ideas to problems for better products

Westinghouse products are designed with a realistic relationship to problems of not only electrical protection but also load growth, system investment and other factors. Because of this, these products perform better, longer and more usefully. As a group, Westinghouse apparatus goes a long way toward providing system reliability and operating common sense.

To pit new ideas against your problems, Westinghouse has an engineering facility unmatched in the industry. For example, research tells us what is literally possible; system studies, what is economically practical; design, what is physically best. Blending of ideas, methods and materials is the responsibility of these teams of scientists and engineers.

In these pages, we have shown you a variety of new and improved products . . . from end to end of the distribution system. This offers you a clew to Westinghouse look-ahead engineering ability.

The Man With The Facts . . . your Westinghouse sales engineer . . . is the one man who can bring this wealth of ready experience to bear on your problems and plans.

Call *THE MAN WITH THE FACTS...* for this service package, or write to Westinghouse Electric Corporation, 3 Gateway Center, Pittsburgh 30, Pennsylvania.

YOU CAN BE **SURE**... IF IT'S

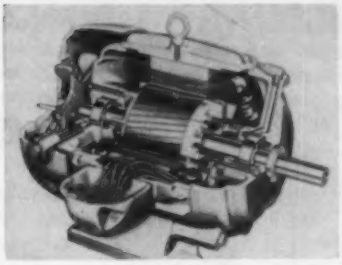
Westinghouse

Larry Wrentmore demonstrates the progress made in distribution transformers in just 8 years.

CP-1028

New Equipment

(*Continued from page* 138)



sipation. Improved slinger seal on the shaft adjacent to the bearing prevents intrusion of moisture to the interior. Ventilating fan is housed in a cast-iron fan guard and has a split hub to facilitate assembly. Ball bearings are equipped with a transverse lubrication system to permit thorough purging of old grease, if desired.

The Type J is available in ratings from 1 to 10 hp and in a fanless type for lower ratings from 1 to 1½ hp. Details in Bulletin No. 1879.

U. S. Electric Motors Inc, Box 2058, Los Angeles 54, Calif.

Post Hole Digger

A rear power source for pick-up trucks operates a light-weight post hole digger. Designed for one man digging, the unit is easily controlled by built-in hand clutch. A slip clutch provides extra operating safety. The digger is said to have the ability to be angle-operated any place within a 4 x 8 ft area without respotting the truck. Holes up to 40 in. deep and 10 in. dia can be bored either vertically or at a sharp angle.

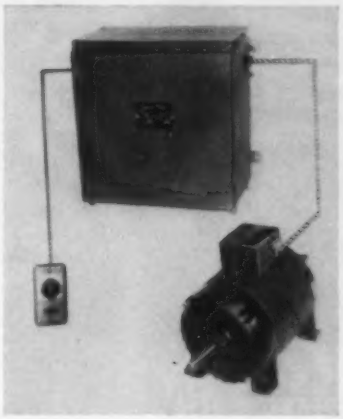
The rear power source kit adapts to most light and medium duty trucks and terminates in a standard spline for driving a variety of equipment.

H. S. Watson Co, 1316 67th St, Emeryville, Calif.

Adjustable-Speed Drive

Constant linear or peripheral speed of rewinders or inspection tables can be maintained with electronic adjustable-speed drive. A tachometer feedback signal holds speed within desired setting. It is claimed that speed-load regulation is substantially better than available from dc shunt motors when operated from variable-transformer controls.

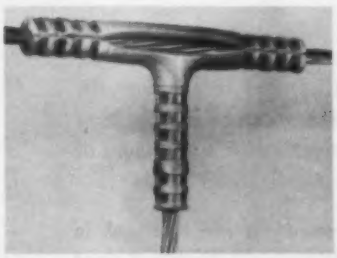
Units are available with base motor speeds of 1,800 or 3,600 rpm. Motors



supply constant torque over a 30:1 speed range.

The rectifier cabinet can be wall or bench mounted. A compact control head utilizes low-voltage circuits and can be installed at remote points. This control includes a speed-adjusting knob and a stand-by switch to start or stop the motor.

Servo-Tek Products Co, Inc, 1086 Goffle Rd, Hawthorne, N. J.



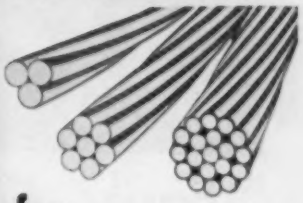
T-Connector

Aluminum T-shaped universal compression tap connector is designed for overhead service connections. A C-shaped run element and a tubular

(*Continued on page* 152)

ACCO Quality

PAGE Stainless Steel Strand



for Severe Service Conditions

PAGE Stainless Steel Strand is equally versatile for ground, guy and catenary applications. Its higher tensile strength, corrosion-and-abrasion resistance, elastic limit and strength-to-weight ratio make it your first choice! Its lower cost per year of use means long-range economy.

Write us at Monessen, Pa., for complete information

ACCO

Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Bridgeport, Conn.

PAGE STEEL AND WIRE DIVISION
AMERICAN CHAIN & CABLE

for Better Value

Easily...Economically
with Subalox

Subalox is a complete paint system, so easy and economical to use that a single coat gives an excellent and lasting job. Can be applied by customary methods, but for most satisfactory application we recommend floor brooms.

Subalox is based on a heavy collodial lead pigment which gives excellent rust protection and limits spattering when applied to wire mesh.

Subalox is available in a variety of colors—the most popular being the metallics used to simulate the appearance of galvanizing. Old fences can be given a "new look" which can be easily maintained with a minimum of time, labor and material cost.

Detailed instructions are contained in "SIMPLIFIED FENCE PAINTING"—yours for the asking.

Subox Inc.

3 Fairmount Plant, Hackensack, N. J.

New Equipment

(*Continued from page* 151)

tap element take a wide range of copper, aluminum, and ACSR conductors from No. 4 to 400 Mcm. The extended contact area of tap elements prevents joint deterioration from galvanic corrosion and assures a stable high-conductivity joint.

Type YTU connectors are installed with manual or hydraulic tools. All sizes fit a single die set or crimping groove.

Burndy Engineering Co, Inc, Norwalk, Conn.

Solder Pot

A silver solder pot features small size, portability, and a replaceable ceramic crucible. The ceramic is a formulation claimed to be resistant to the types of fluorides present in fluxes. It is replaceable by being lifted out of the unit. Inside dimensions of crucible are ¾ in. dia x 2 in. deep.

The Model 201 has a 6 in. cube metal case with a housing containing pilot light and rheostat. The rheostat varies operating temperature over a range of approximately 1200 to 1700F. Power is 200 w at 110 v.

Dee Electric Co, 1101 N. Paulina St, Chicago 22, Ill.

Steel Battery Racks

Greatly increased resistance to severe shock and vibration is claimed for all-steel, earthquake-proof battery racks. Said to be the first to use all-steel construction, the racks are suitable for all makes of storage batteries

(*Continued on page* 155)

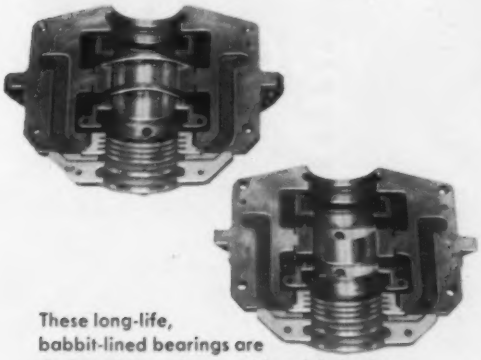
NEW
functional appearance

NEW
improved ventilation

NEW
bracket construction

NEW
dripproof protection

...keep Elliott out ahead in large 4-or-more pole induction motor design



These long-life, babbit-lined bearings are designed to give positive lubrication. Note the removable and adjustable labyrinth-type bearing seals. These prevent oil or oil vapors from being drawn along the shaft onto the motor windings.

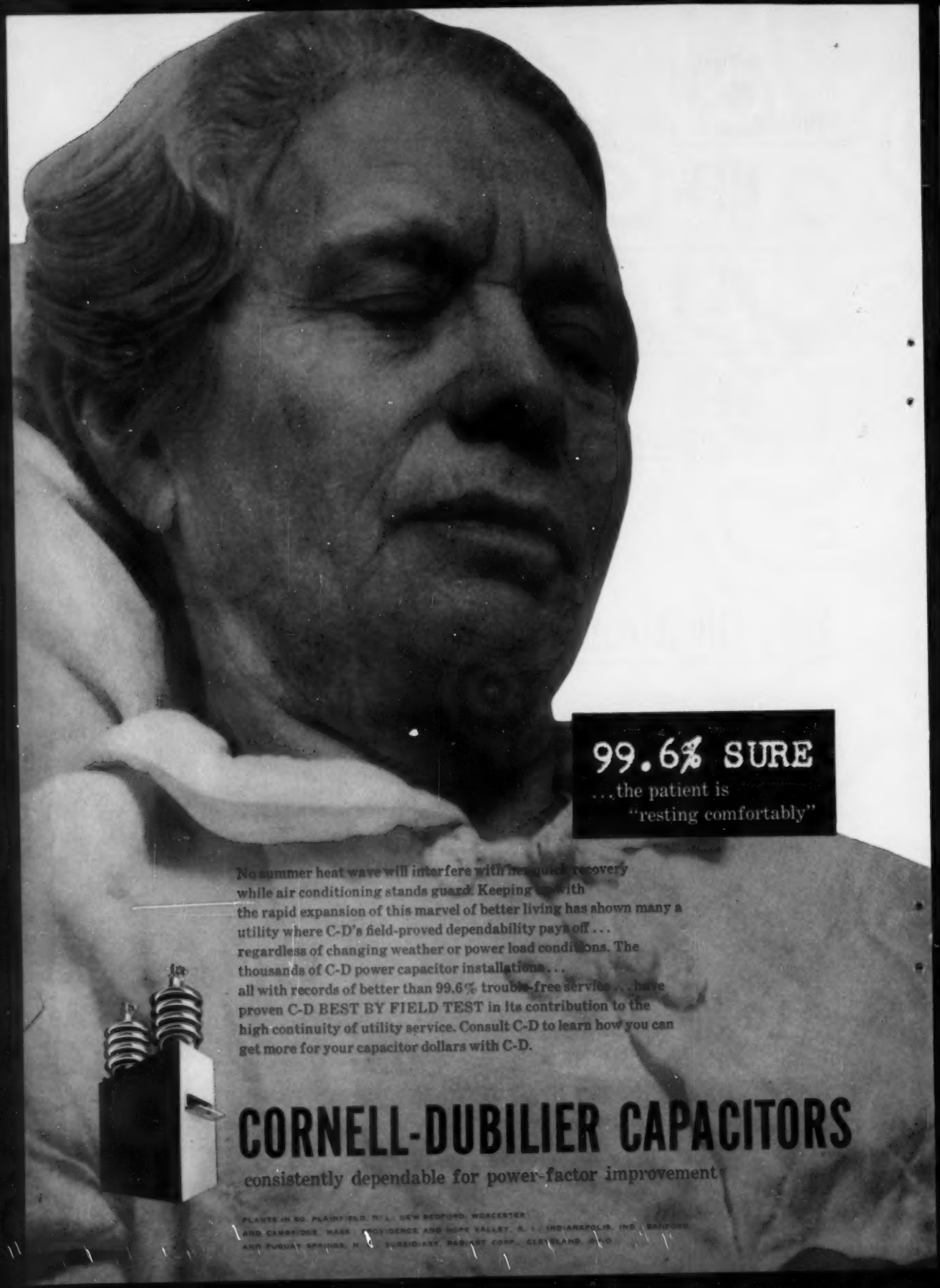
It's the latest Elliott step forward in motor construction to bring you improved performance and simpler maintenance. Note the modern functional design of the rectangular frame. Important structural strength for lifting also is contained in this frame construction. Other features you will like are the heavy rigid flat steel plate bearing brackets, split horizontally with the upper half easily removable for internal inspection. Ring-oiled split sleeve bearings are built to stand abuse and Kolene-processed to last. Get complete details in Bulletin PB 7000-2. Write Elliott Company, Ridgway, Pa.

Elliott FABRI-STEEL

ELLIOTT Company

RS-1

TURBINE-GENERATORS · TURBINES · MOTORS · GENERATORS · DEAERATING HEATERS · EJECTORS · CONDENSERS · COMPRESSORS · TURBOCHARGERS · TUBE CLEANERS · STRAINERS


99.6% SURE
...the patient is
"resting comfortably"
No summer heat wave will interfere with heart quick recovery
while air conditioning stands guard. Keeping pace with
the rapid expansion of this marvel of better living has shown many a
utility where C-D's field-proved dependability pays off...
regardless of changing weather or power load conditions. The
thousands of C-D power capacitor installations...
all with records of better than 99.6% trouble-free service...have
proven C-D BEST BY FIELD TEST in its contribution to the
high continuity of utility service. Consult C-D to learn how you can
get more for your capacitor dollars with C-D.
CORNELL-DUBILIER CAPACITORS
consistently dependable for power-factor improvement
PLANTS IN SO. PLAINFIELD, N. J., NEW BEDFORD, WORCESTER
AND CAMBRIDGE, MASS., PROVIDENCE AND HOPE VALLEY, R. I., INDIANAPOLIS, IND., BAMFORD
AND PUQUAY SPRINGS, N. Y., SUBSIDIARY, RADART CORP., CLEVELAND, OHIO

CORNELL-DUBILIER
power-factor
capacitors
give you better than 99.6%
trouble-free service*

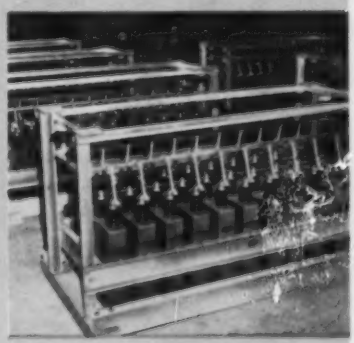
C-D capacitors are impregnated and filled, in hermetically sealed containers with non-inflammable, non-explosive Dykanol. In addition, C-D's conservative engineering and design makes possible the use of special impregnants to fulfill even the most exacting requirements of sub-zero switching operations.

C-D's rack capacitors are shipped completely assembled ready for energization. Again C-D's conservative engineering standards provides the structural strength to do this and as a result save the utility time, assembly and installation costs in the field.

Lowest volts per mil unit stress results in the extra margin of safety necessary to withstand all system high voltage transients. This lower volts per mil and lower volts per section feature is the utility's assurance of extra longevity when C-D's are specified.

Only C-D power capacitors are subjected to a full-rated voltage energization test. C-D removes potential trouble-makers before they get on your poles . . . not after with costly replacements.

Why is it that only C-D power capacitors give you assurance of complete dependability? . . . because C-D's built-in safety factor results from the ultimate in tried and proven design levels coupled with conservative production techniques and rigorous quality control. For catalog write to Cornell-Dubilier Electric Corporation, South Plainfield, N. J.



C-D 550 KVAR; 2,400V; single-phase, open frame, stacking rack capacitor assemblies.

*This is an average based on reports from leading utilities using C-D capacitors. Many of these reports have shown 100% trouble-free service, and none lower than 94.9%.

New Equipment

(*Continued from page* 152)

in emergency power applications.

Side rails which support the batteries are adjustable to fit cells of varying width. End rails, adjustable to any battery length, eliminate cutting rails for a custom fit. Full length spacers between cells prevent breakage of jars and covers in earthquake tremors.

Four basic designs available are single-row, one tier; single-row, two tier; two step; and three step. Request forms 5669, 5670, 5671, and 5672. **Dept SP697, Exide Industrial Division, The Electric Storage Battery Co, Box 8109, Philadelphia 1, Pa.**

Guy Hook

Television and radio interference is minimized with a line of malleable iron down guy attachments. An integral conical spur at the base affords adequate stability, without using a separate lag screw, and eliminates a "loose hardware" problem. Design features such as loop retaining ears, channel back, and wide heel pad are also incorporated.
Malleable Iron Fittings Co, Branford, Conn.

Time Delay Relay

New time delay relay has capacity to handle motor loads directly without requiring an additional contactor. Locking type rheostat screwdriver adjustment selects a time delay from ½ to 6 sec. The relay operates on 60 cycles from 120 to 600v. Models for other frequencies and dc are available. Additional applications for

(*Continued on page* 156)

"We've used dbpc® antioxidant for over 5 years to give our transformer oil long life and keep it sludge free"

says L. J. Gill

ASSISTANT TO SUPERINTENDENT
LINE AND SUBSTATIONS DEPT., PENNSYLVANIA POWER & LIGHT CO.

"We have been reclaiming transformer oil for five years," says Mr. Gill, "and from the start have inhibited all of this oil with **dbpc**. This program has proved very successful, and we have realized substantial yearly savings."

This Koppers antioxidant is remarkable for extending the service life of used oil after reclaiming. Badly deteriorated and heavily sludged transformer oil can be restored by treatment with fuller's earth and **dbpc** so that it will actually outlast brand new *uninhibited* oil.

Because of its exceptional performance in new transformer oil, all equipment manufacturers supply **dbpc**-inhibited oil as a standard item in their distribution units. Field tests prove that new transformer oil treated with only 0.3% of **dbpc** will last three to five times longer at a cost of less than .3 cent per gallon.

SEND THIS COUPON FOR FURTHER INFORMATION

Koppers Company, Inc., Dept. EW-375
Chemical Division
Pittsburgh 19, Pennsylvania

Please send me full information on the use of **dbpc** in transformer insulating oil.

Name.....Title.....

Company.....

City.....State.....

KOPPERS COMPANY, INC.

CHEMICAL DIVISION, DEPT. EW-375 PITTSBURGH 19, PENNSYLVANIA

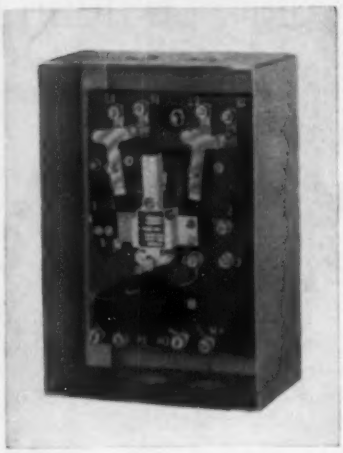
KOPPERS ®

Koppers Chemicals

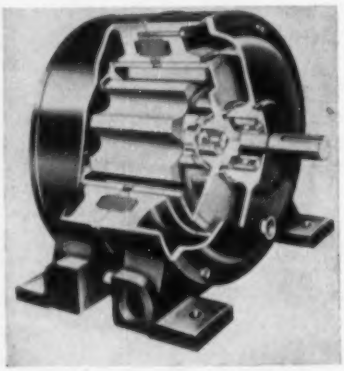
SALES OFFICES: NEW YORK · BOSTON · PHILADELPHIA
ATLANTA · CHICAGO · DETROIT · LOS ANGELES

New Equipment

(*Continued from page* 155)



the relay are: dynamic braking for ac motors without using a separate dc source, "single pulse" time delay operation, and repeated cycling without closing an external contact.
Automatic Switch Co, 391 Lakeside Ave, Orange, N. J.

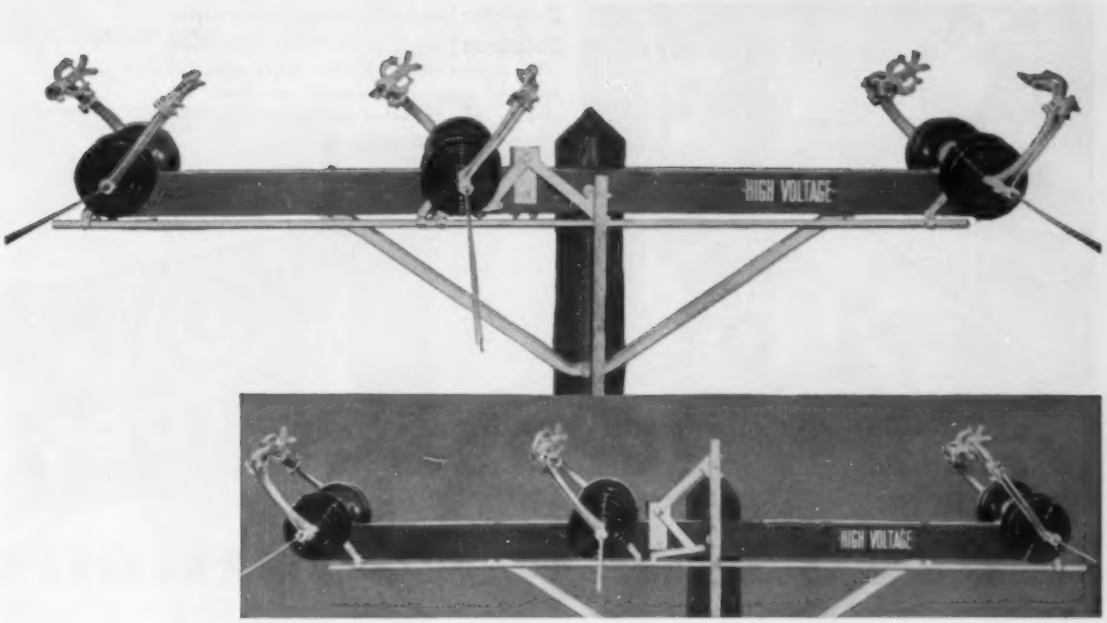


Adjustable Speed Drive

Wide speed ranges at constant or reduced torque are obtained with an eddy-current power transmission device. Various ac operated mechanisms provide step-less speed control with the stationary field, liquid cooled Dynaspede Coupling.

The absence of rotating slip rings, brushes, commutators and coils is reflected in reduced maintenance and adaptability to hazardous, moist and dirty locations. Bulletin SF-1
Dynamatic Division, Eaton Mfg. Co, Kenosha, Wis.

(*More New Equipment on page* 159)



Note clean, neat pole top appearance of KPF switches open (top picture) and closed. Appearance is marked contrast with usual clutter of mechanism.

Simple design and sturdy construction insure years of trouble-free switching

KPF Air Break Switches look different because they *are* different. They are the simplest air break switches made. They consist of two rigid dead-end insulator assemblies with rigid jumpers forming the switch arms. One assembly is mounted stationary to the cross-arm. The other rotates to make and break the circuit. There are no complex parts to get out of order, require lubrication, adjustment or other service. Sturdy KPF switches serve indefinitely.

Simple design also means simpler manufacturing and lower cost. No separate dead-ends or extra insulators are required.

Finally, installation normally requires less than half the normal time. Phase units are shipped ready for use and need only be bolted to the cross-arm.

KPF Air Break Switches have been used for almost 50 years on lines ranging from 7.5 to 110 kv. Tens of thousands are in use today by Pacific Gas & Electric, Southern California Edison, Minnesota Power & Light and other leading power companies.

For the world's simplest, surest, lowest cost air break switch, specify KPF Air Break Switches—standard for nearly 50 years.

New catalog gives complete specifications, detail drawings, installation information.

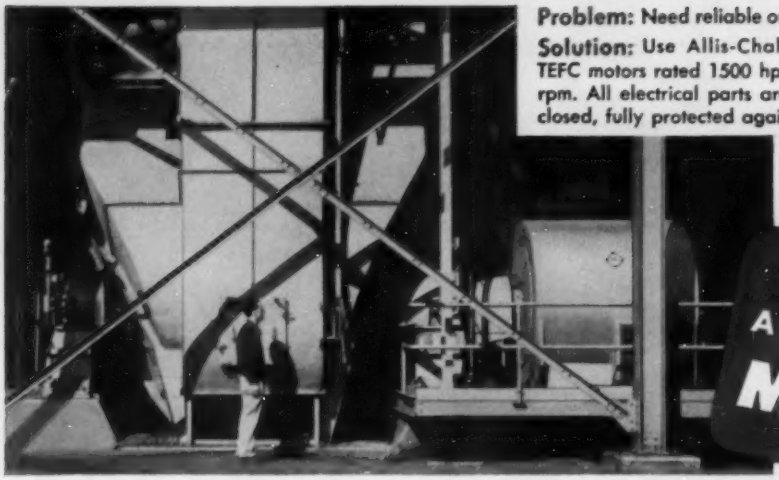
KPF ELECTRIC COMPANY

1624 East Alpine Avenue, Dept. E, Stockton 5, California

KPF

AIR BREAK SWITCHES

Standard for nearly half a century



Problem: Need reliable outdoor operation.

Solution: Use Allis-Chalmers tube-type TEFC motors rated 1500 hp, 4000 volts, 880 rpm. All electrical parts are completely enclosed, fully protected against weather.

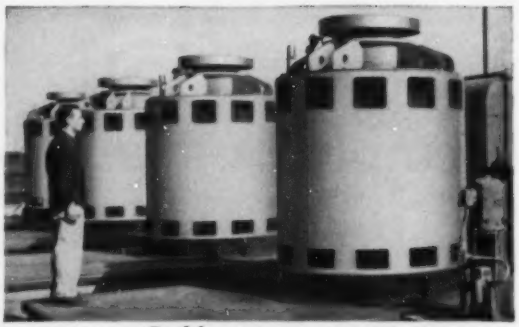
ALLIS-CHALMERS
Auxiliary-Drive
MOTORS

3 Problems — 3 Solutions

Eastern Utility Gets Exactly the Right Motor for Each Job from Allis-Chalmers

Public Service Electric and Gas Company chose Allis-Chalmers motors for many of the major auxiliaries in their Kearny (N. J.) Generating Plant. The reasons: reliability and economy.

Allis-Chalmers builds a type and size for every auxiliary drive in the power plant. Whether your problem is space, fly ash or an outdoor location, there's a motor in the Allis-Chalmers line to provide the continuity of service you need. Let an Allis-Chalmers representative help you select the motors for your job. A-4582



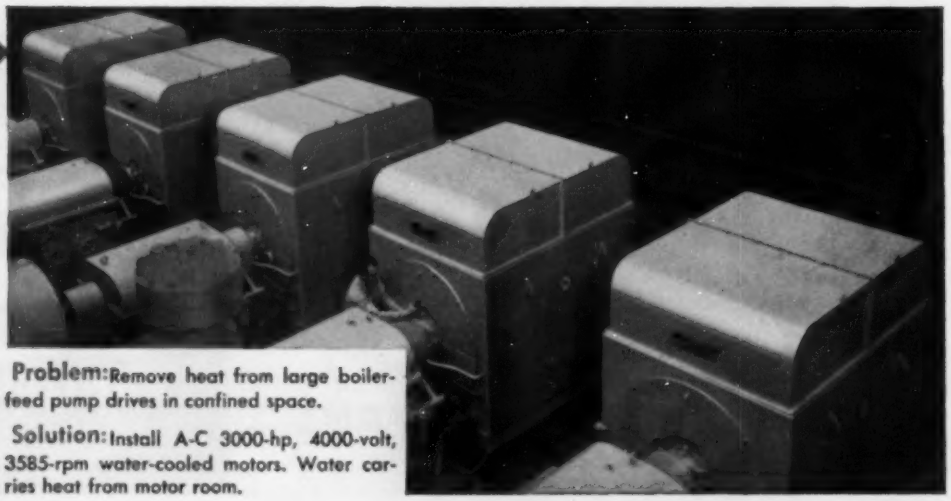
Problem: Keep building costs down.

Solution: Put pump drives outdoors, using Allis-Chalmers tube-type TEFC motors rated 350 hp, 440 volts, 400 rpm.

ALLIS-CHALMERS

Milwaukee 1, Wisconsin

A-C ALLIS-CHALMERS



Problem: Remove heat from large boiler-feed pump drives in confined space.

Solution: Install A-C 3000-hp, 4000-volt, 3585-rpm water-cooled motors. Water carries heat from motor room.

New Equipment

(*Continued from page* 156)

Testing Device

A simplified live line detector, fabricated almost entirely of laminated plastics, provides a safe, practical method of checking the potential of all types of high voltage lines and equipment. The Glowtector detects voltage by means of a small gas-filled tube which glows brightly upon contact with ac voltages from 2.2 to 500 kv and frequencies of 25 cps or more.

The unit consists of an electrode which is touched to the line or equipment being tested, a glow tube, and a hood which shields the tube to insure maximum visibility when used on outdoor equipment or in bright sunlight. Overall length is 12.5 ft.

R&IE Equipment Division, I-T-E Circuit Breaker Co, Greensburg, Pa.

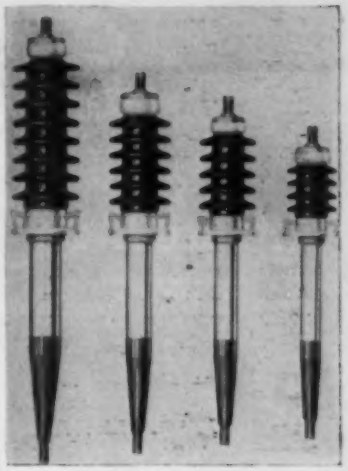
Reel Trailer

Reel loading and transport can be safely handled by one man with hydraulic operated lift trailer. The Reelmaster handles standard cable reels up to 72 in. diam. by 40 in. wide. Hydraulic cylinders lift the reels on a 2½ in. diam. reel bar. Mechanical stops carry the load when traveling. A quick-detachable tandem towing bar permits multiple hook-up for towing several units with one power vehicle. A universal hitch permits use with tractor or with trucks for cross country transport.

Independent hydraulic pumps for each wheel cylinder permit leveling reel on trailer. A forked handle operates both units simultaneously. Reels

are carried slightly behind the wheel center so tongue load is lighter as the reels get heavier.

Standard Trailer Co, 415 San Leandro Blvd, San Leandro, Calif.



Bushings

A line of high-voltage bushings, complying with ASA Standards, reduces bushing variety to a relatively small number of separate designs. Standardization provides for interchangeability at various voltage levels and affords an opportunity to effect radical reductions in replacement stocks.

Bushings are available in standard ratings of 23, 34.5, 46, and 69 kv.

Ohio Brass Co, Mansfield, Ohio

Cutout

Load break cutout features a lock-in device which locks the fuse holder in closed position during load break operation. This permits all arcing to

(*Continued on page* 160)

Earth Drill

Heavy-duty drill attachment for 50-hp crawler tractor facilitates post-hole digging in remote locations. The Model YT earth drill is driven through tractor power take-off and can bore holes up to 24 in. diam. Adjustment for drilling positions is hydraulically controlled. The unit is mounted on the rear of the tractor and can be provided with a pole setter capable of handling poles up to 45 ft long.

A front mounted dozer or shovel makes the HD-5 tractor a versatile unit.

Allis-Chalmers Mfg. Co, Tractor Division, Milwaukee 1, Wisc.

New CONSTRUCTION AND OPERATING FEATURES . . .

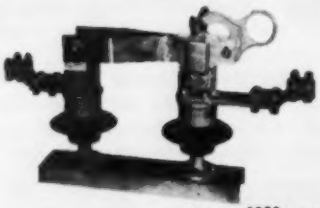
THE ROYAL TYPE BT SWITCH

• • • • using previously proved sound design as a basis, has been engineered to achieve a clean cut, simple, and positive operating switch

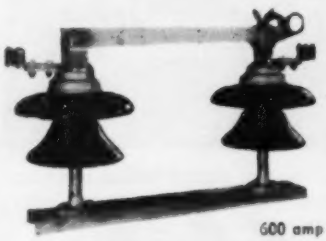
CLEAN CUT • SIMPLE • POSITIVE

Parts above insulators are all non-ferrous

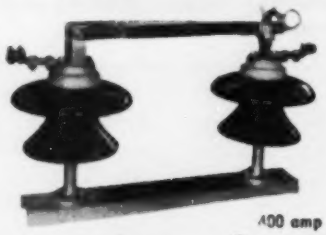
THE completely housed contact affords maximum protection against snow, sleet, and dirt. The positive latch acting on blade adjusts automatically for dimensional variations due to temperature changes, mountings, or insulator deflection. Large area TONGUE TYPE front and hinge contacts are machined and ground to close tolerances. Heavy pull rings with pry-out feature and large eyes are provided. These rings are easily found, even at night, with a hook stick. 90° blade stops are optional. Grind finish contact surfaces provide multiplicity-of-point contact. These surfaces are heavily silvered, with the silver metallurgically bonded to the contact surfaces. Trussed type copper blades insure rigidity.



1200 amp



600 amp



400 amp

Royal

A Part of the Arsenal of AMERICAN POWER PRODUCTION

ROYAL ELECTRIC MANUFACTURING COMPANY

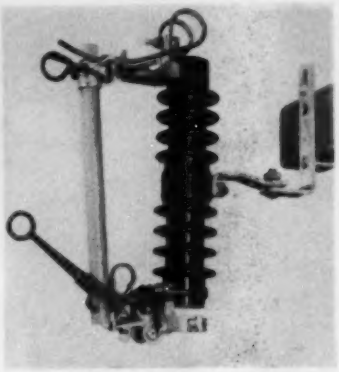
INCORPORATED

1122 EAST 87th STREET Chicago 19, Ill.

Designers and Manufacturers of Power Switching Equipment and Special Electrical Devices

New Equipment

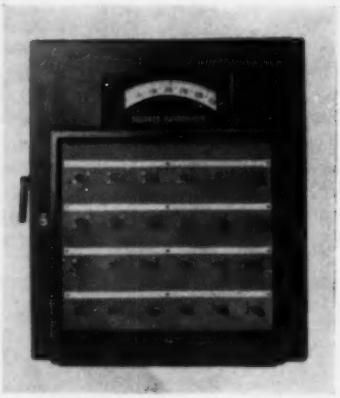
(*Continued from page* 159)



be confined in the fuse tube while the load break lever is being operated. Return of lever to original position after it has been pulled down, releases the safety latch and the fuse holder drops out and swings down.

Current rating is 100 amp, with interrupting capacities up to 10,000 amp. It is available in voltages of 5.2, 7, 8, 15, and 18 kv.

R&IE Equipment Division, I-T-E Circuit Breaker Co, Greensburg, Pa.



Precision Indicator

Up to 48 different process variables may be measured with a new precision indicator. An intermittent record is obtained when the unit is used in conjunction with a multi-point strip-chart recorder. Available in two basic types, dc potentiometer or ac bridge; the unit can be provided as a single-point or multiple-point instrument.

The Type HJ precision indicator has a concentric rotating scale 32¾ in.

(*Continued on page* 162)

Completely New

"SILVER" INSIDE FINISH ON TRIANGLE E.M.T.

Makes Wire Pulling Easier—

and it Protects!

Introduced only a few weeks ago, Triangle E. M. T. with the new "Silver" inside finish has already won the acclaim of hundreds of contractors, engineers, electricians and maintenance men. Those who have seen or tried this new E. M. T. are specifying it. Already, many orders are marked: "E. M. T. with new 'Silver' inside finish."

This new "Silver" finish on the *inside* of all Triangle E. M. T. makes a hard, smooth, clean raceway—a raceway that not only makes wire-pulling much easier but gives unprecedented protection against the ravages of moisture, chemicals, oils, greases and fumes.

It's completely new! It's different! Ask your distributor about Triangle's new E. M. T. with the "Silver" inside finish. It costs no more than ordinary E. M. T.

It Must Be Right

The Trade Mark of TOP Quality

TRIANGLE

TRIANGLE CONDUIT & CABLE CO., INC.

NEW BRUNSWICK, N. J.

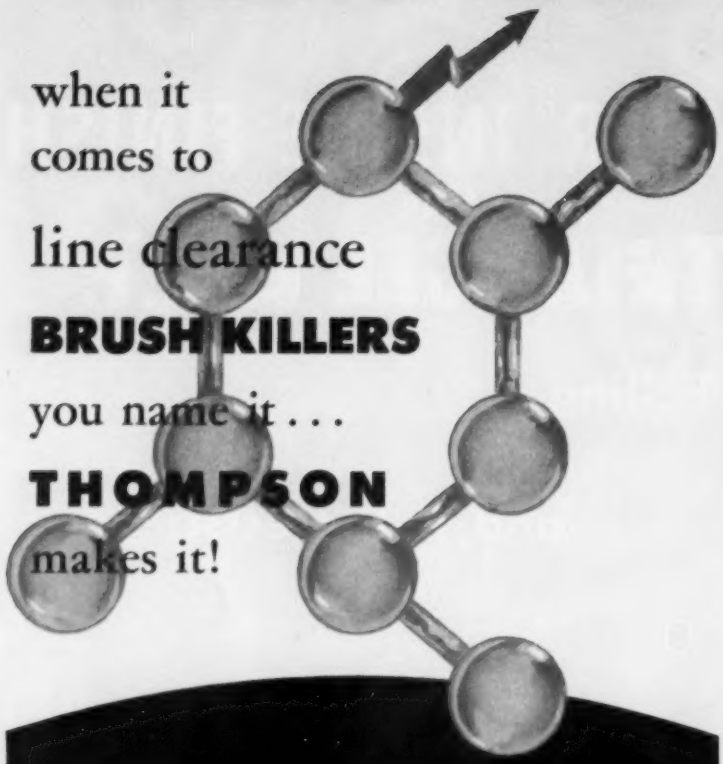
Manufacturers of Arteries for Electricity, Liquids and Gases

WIRE • CABLE • CONDUIT • PLASTIC PIPE • BRASS AND COPPER TUBE

PLANTS—NEW BRUNSWICK, N. J.: WIRE AND CABLE PLANT • ROD MILL • BRASS AND COPPER TUBE MILL • PLASTIC PIPE PLANT • **MOUNDSVILLE, W. VA.:** CONDUIT PLANT

WAREHOUSES—BOSTON • CHARLOTTE • CHICAGO • LOS ANGELES • SAN FRANCISCO

when it
comes to
line clearance
BRUSH KILLERS
you name it . . .
THOMPSON
makes it!



Thompson, one of a handful of America's basic manufacturers of selective herbicides, makes every type of proven efficiency — ready for your use — whether you employ foliage spray, basal bark or stump treatment.

LOW VOLATILE

BRAMBLCIDE 5 — L. V.
2,4,5-T

BRAMBLE-WEEDICIDE 5 — L. V.
2,4-D — 2,4,5-T

CONTROLLED VOLATILITY
BROAD SPECTRUM — PENTYL ESTERS

BRAMBLCIDE
BRAMBLE-WEEDICIDE
BRAMBLCIDE 5
BRAMBLE-WEEDICIDE 5

BROAD SPECTRUM . . . or LOW VOLATILE . . . whichever you prefer, Thompson's delivers *more kill per gallon* because every gallon is fortified with a new and exclusive surfactant perfected in the Thompson laboratories. No other "creeping agent" duplicates its performance.

MORE GALLONS PER DOLLAR . . . when you specify Thompson you get a finished product from the basic producer . . . your most economical method of buying.

for most efficient kill at lowest cost*

SPECIFY . . . Thompson Chemicals FIRST NAME IN BRUSH KILLERS

Write for station paper 19. It provides latest research on right of way herbicides, their selection and application.

THOMPSON CHEMICALS CORP.
St. Louis 3, Mo. Los Angeles 27, Calif.

agents in principal cities

New Equipment

(*Continued from page* 160)

long with a response time for full-scale travel of either 4 or 12 sec on 60-cycle operation.

The indicator incorporates a magnetic standard to provide continuous measurement and standardization. Elimination of standard cells allows operation in ambient temperatures as low as 0F or as high as 125F. Plug-in components and standard, unmatched tubes help make the instrument easy to service.

General Electric Co, Schenectady 5, N. Y.

Linear Accelerator

Thick metals (up to 15 in.) may be examined with a line of microwave linear accelerators. Exposure time for 15 in. steel is 20 to 30 min with this compact, high-speed unit. Input power is about 15 kw at the magnetron installation. The electron beam power is about 1 kw in the range of 4 to 6 million electron-volts.

High Voltage Engineering Corp, Cambridge, Mass.

Panel Meters

Wrap around shrouds are claimed to increase readability and improve appearance of hermetically sealed, ruggedized panel instruments. Ammeters are available with ranges from 0-20 μa and 0-5 amp, either ac or dc. Voltmeters have ranges from 0-500 v ac and 0-800 v dc. Meter accuracies are 2% of full scale. Zero adjustment can be made from the front for greater accuracy.

(*Continued on page* 164)

FACT:

Versatility, economy of Type A recorders help you establish greater system efficiencies

Dependable Westinghouse Type A recorders have gained wide acceptance by utilities for making load surveys. Industry has found them ideal for checking machine operation and factory distribution systems.

FACT: Low Cost—your recording costs are low with the Type A because it is simplified, easy to service . . . maintenance costs are kept to a minimum. The Type A is also low in initial cost . . . you can use it freely whenever, wherever you wish.

FACT: Dependable—high-torque mechanisms give you maximum operating stability under the most severe conditions. Pen friction is decreased, energy consumption is low, precise leveling is unnecessary.

FACT: Versatile—Westinghouse Type A recorders are available in five types to meet your every need for low-cost recording of a-c and d-c voltage and current: portable, switchboard flush, switchboard projection, wall mounting, socket mounting.

You can be sure of accurate recordings or indications of electrical values, whatever the application, when you specify Westinghouse instruments.

• • •

FOR MORE FACTS: Call *The Man With The Facts* . . . your Westinghouse sales engineer. Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-40465

YOU CAN BE SURE . . . IF IT'S

Westinghouse

NEW ELECTRO SWITCH CATALOG

A CATALOG OF
Low-cost → *Dependable*

ROTARY MULTIPOLE SWITCHES for INSTRUMENT, TRANSFER, and SELECTOR SERVICE.

ESCO instrument switches permit control of complex circuits with a single compact switch instead of separate switches.

This catalog covers ESCO Type P snap-acting switches, with up to four selector positions, handling 10 amperes at 120 volts a-c, 5 amperes at 240 volts a-c, 3 amperes at 450 volts a-c or 5 amperes at 125 volts d-c, 3 amperes at 250 volts d-c.

The catalog also lists ESCO JR detent-action switches with up to eight selector positions, handling 10 amperes at 125 volts a-c or 5 amperes at 125 volts d-c.

The basic structure of ESCO rotary switches provides for extreme flexibility in design. Tell us your circuit arrangements and the sequences you need, and we will recommend the correct switch for your use.

Write TODAY for your copy of this new catalog.

ELECTRO SWITCH
CORPORATION
Weymouth 88, Massachusetts

New Equipment

(*Continued from page* 162)

Instruments are designed to meet MIL specifications and are available in standard sizes from 1.5 to 4.5 in. OD.

Instrument Division, Roller-Smith Corp, 1755 W. Market St, Bethlehem, Pa.

Transformer Bushing

Bushing design permits outside tightening between porcelain and metal parts thus eliminating the necessity of bushing removal. The 8.7 kv sidewall porcelain transformer bushing has a bakelite clamping knob especially selected to withstand weathering and aging. A floating anvil under spring pressure and serrated clamping surfaces are said to provide excellent contact and holding power against vibration.

A copper conductor adapter accommodates all types and sizes of transformer leads.

Lapp Insulator Co, Inc, Le Roy, N. Y.

Resistance Meter

A portable 10 kv insulation resistance meter checks polarization index and leakage current as well as degrees of insulation resistance up to 200,000 megohms at 10 kw. Resistance readings are made directly for specified voltage. Dc voltage output is adjustable from 0-10,000 v of either polarity. It will handle capacitances normally found in large, high-voltage apparatus.

The resistance meter includes a built-in voltage stabilizer to insure accurate current readings, plus a high sensitivity and readability of 0.02 micro-amp per scale division on a low range of the 3.5-in. scale.

The meter operates on 105-125 v, 60 cps, fused for a 20-amp start. It weighs 110 lb net.

General Electric Co, Schenectady 5, N. Y.

(*More New Products on page* 166)

Designed to save time...

INTERNATIONAL cab-forward
RC-180 Series equipped with special line construction body with 4-man integral crew compartment. Famous Comfo-Vision cab. Choice of gasoline or LPG power. GVW ratings, 17,000 to 21,000 lbs. Wheelbases, 112 to 172 inches.

Built to save money

There's nothing like cab-forward INTERNATIONAL models to cut the costs of service jobs requiring the transport of bulky equipment and a number of men.

These short-wheelbase trucks, with their short turning radius, provide quick, easy maneuverability in narrow alleys, congested streets and other hard-to-get-around-in areas. They spend less time getting to the job and away from it—let your crews do more productive work each day.

And these INTERNATIONALS save you money further because they are built with famous INTERNATIONAL quality, Tough-Job engineering and all-truck design. Because they have all the features for long life, low-cost operation and maintenance that have made INTERNATIONAL the heavy-duty sales leader for 23 straight years.

Call your INTERNATIONAL Dealer or Branch representative and ask for complete details on the model or models best suited to your needs.

INTERNATIONAL HARVESTER COMPANY • CHICAGO

WORLD'S MOST COMPLETE TRUCK LINE

200 basic models from ½-ton pickups to 90,000 lbs. GVW off-highway models, including six-wheel, four-wheel-drive, cab-forward, cab-over-engine and multi-stop delivery types . . . 32 engines from 108 to 356 hp., with widest choice of gasoline, LPG, or diesel power . . . wheelbases, transmissions, axle ratios for any need . . . thousands of variations for exact job specialization.

International Harvester Builds **McCORMICK** Farm Equipment and **FARMALL** Tractors...Motor Trucks...Industrial Power...Refrigerators and Freezers

Watch "The Halls of Ivy," with Ronald Colman and Benita Hume, CBS-TV, Tuesdays, 8:30 p.m., EST

INTERNATIONAL TRUCKS
"Standard of the Highway"

Save time testing watthour meters with the

KNOPP

Meter-Testing Equipment, Type TE-7

Power companies the nation over, save time, save money, and build customer goodwill when testing watthour meters with the Knopp Meter-Testing Equipment.

Its new, more-convenient switching arrangement for connecting meter elements permits 2-element and 3-element polyphase meter testing without changing connections. Has Knopp Unload System enabling testing of both elements of a 3-wire, single-phase meter simultaneously without opening the potential link.* Basic constant of rotating standard adjustable to match basic constant of meter-under-test.* Includes photoelectric counter and other time-saving features for accurate testing.

Tests all types of watthour meters. Provides voltage ranges of 120, 240, and 480; current ranges of .25, .5, 1, 1.5, 2.5, 5, 10, 15, 25, and 50. Overall equipment accuracy within .05%.

*Patents Pending

For Fast Field-Test of Watthour Meters, use the Knopp Unload Test Set, Type FS-5, up to 50 amps. Type FS-4 tests meters of 5 and 15 amps. Easy to use, rugged, reliable.

The Knopp Phase Sequence Indicator — for 2-phase 3 wire and 3-phase 3 wire; 60 volts to 600 volts. Rotating Indicator shows sequence A-B-C or C-B-A. Lightweight, compact. Big timesaver.

Also: Knopp Precision Transformers; Knopp Unload Equipment for testing instruments and instrument transformers.

For complete technical descriptions please write us today

KNOPP

Electrical Facilities Inc.

4236 Holden St., Oakland 8, Calif.

MORE NEW PRODUCTS

about which you should know

Square D Co, 4041 North Richards St, Milwaukee 12, Wisc., offers a piston-operated hydraulic **pressure switch** for hydraulic machine tool applications. Switch has snap action contacts, one normally open and one normally closed, for ac and dc control circuits. Ranges are 135 to 1000 psi or 400 to 3000 psi. Ask for Class 9012 Type ADW bulletin.

Union Carbide and Carbon Corp, 30 East 42nd St, New York 17, N. Y., offers a new type **silicone rubber** with unusually low compression set characteristics over a wide range of hardnesses. W-96 Silicone Gum has good resistance to high pressure steam and can be filled with a variety of carbon blacks.

General Electric Co, 1 River Rd, Schenectady 5, N. Y., offers telemetering equipment which makes operation of frequency type **telemeter** on supervisory channel possible. Measurements of current, voltage, power, water level, reactive power, and other factors can now be made at remote points without a separate telemeter channel.

Raytheon Manufacturing Co, Waltham 54, Mass., has designed an electronic **depth sounder** for charting the bottoms of lakes, rivers, and shoal waters. Model DE 119 weighs 40 lb and is powered by a 6 v storage battery. It is accurate over a range 0 to 240 ft of depth and is readable in four phases.

J. D. Gould Co, 730 E. Washington St, Indianapolis 2, Ind., has direct lift **solenoid valves** for high pressure applications. Maximum pressures are 1,000 psi for air and gas, 600 psi for water, 500 psi for oil, and 200 psi for steam. Types F and G are made in ⅛ and ¼ in. pipe sizes, with ports from 1/16 to ¼ in. Ask for Bulletin F-1.

Gedney Electric Co, RKO Building, Radio City, New York, N. Y., has hot dip galvanized, malleable iron, "Static Preventative" **ground clamp.** Sizes from 1/22 in. to 8 in. have terminals which accommodate 8, 6 or 4, bare or insulated, ground wire.

General Electric Co, Trumbell Components Dept, Section TC-1, Plainville, Conn., has **load centers** with interior snap-action spring clips for installing breakers. Available with 8, 12, 16 or 20 circuits and 100-amp main lugs for service entrance.

Ansul Chemical Co, Marinette, Wisc., has cold weather **fire extinguishers** utilizing nitrogen to expel a dry chemical through a special rubber hose which does not stiffen or crack in temperatures down to −40F. Special nozzles and puncture pin seals insure operation of the 4 and 20 lb portable units and the 150 and 350 lb wheeled units.

John Bean Division, Food Machinery & Chemical Corp, Lansing 4, Mich., has a high pressure **spray unit** which delivers 19,000 cu ft of air per minute to heights of 100 ft. The Rotomist "75" rotates 360 deg and the discharge head pivots in a 110-deg arc from vertical to 20 deg below horizontal.

U. S. Electrical Motors Inc, Box 2058 Terminal Annex, Los Angeles 54, Calif., has increased the rating of their **Varidrive motors** to 60 hp for applications where extra heavy-duty variable speed drives are needed.

Electro Products Laboratories, Inc, 4503 N. Ravenswood, Chicago 40, Ill., offers a dual range **dc power supply** with variable voltages from 0 to 14 and 0 to 28 v. Model "EF" gives less than 1% ripple at 5 amp. and Model "E" less than 5%.

Micrometrical Mfg Co, 345 S. Main St, Ann Arbor, Mich., offers the Type RF Cylinder Pilotor for taking Profilometer **roughness measurements** around the circumference of tubing, round bar stock, and other cylindrical pieces. ID's as small as ¾ in. and OD's from ¾ to 3½ in. may be measured. Ask for Bulletin LT117.

Ilsco Corp, Mariemont, Cincinnati 27, Ohio., has a line of LO **solderless lugs** with open barrel. Lugs are offered in 125, 225, 300, and 400 amp sizes.

Atlas Mineral Products Co, Mertztown, Pa., has Alfane, a mixed epoxy-based **cement** for joining foamed glass, brick, tile, carbon and other materials.

BPA Builds Nation's First 345-kv Line

Sturdy towers of new design proved by full-scale tests carry 176-mile McNary-Ross line

Power transmission history is in the making in the Pacific Northwest, where erection and stringing crews are constructing this country's first 345-kv line. Extending 176 miles from McNary Dam to the Portland-Vancouver industrial area (see map), the new line will ultimately carry about 320,000 kw.

The Bonneville Power Administration's schedule calls for completion of the line by November, 1955. However, it will be operated at 230 kv until transformers for 345-kv operation are installed, probably early in 1956.

FULL-SCALE TOWER TESTS . . . The big steel towers, first of their type designed and built in the United States, were subjected to a series of full-scale tests at Bethlehem Pacific's South San Francisco tower-fabricating shop. The testing equipment used there is the newest set-up of its type in the country. Based on the results, BPA and Bethlehem Pacific engineers were able to design a structure combining maximum strength with minimum weight.

The 918 single-circuit towers used in the line are of exceptionally rugged construction. The standard dead-end tower weighs 13 tons, stands 75 ft high and provides a span length of 1150 ft. Nearly 12,000 tons of tower steel was detailed, fabricated and galvanized by Bethlehem Pacific at the tower-fabricating shops located at South San Francisco and Seattle.

STRUNG UNDER TENSION . . . In order to avoid damage to the conductors, the line was kept off the ground by stringing each cable under 6000 lb tension. The resulting smooth conductor surface is expected to minimize corona loss and radio influence. The cable consists of 1.602-in. diam ACSR with a 19-strand core of 0.0874-in. diam wires overlaid with an 84-strand conductor of 0.1456-in. diam wires.

THREE TOWER SHOPS . . . In addition to the South San Francisco and Seattle shops, Bethlehem has complete tower-fabricating facilities at Leetsdale, Pa., near Pittsburgh. These shops are well equipped and strategically located to fill your requirements.

Variable leg extensions came in handy on this rugged hillside along the Columbia River. The tower shown here is one of the tallest on the line, about 115 ft. The completed line visible at the left extends from McNary Dam to The Dalles. These towers were also supplied by Bethlehem Pacific.

If you would like to have further information about Bethlehem's design and fabrication of transmission towers, just call the Bethlehem sales office most convenient to you.

The new transmission line follows the winding Columbia River Valley nearly due west for 176 miles. It terminates at the Ross substation in Vancouver, across the river from metropolitan Portland.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Bethlehem Pacific Coast Steel Corporation, San Francisco

Export Distributor: Bethlehem Steel Export Corporation, New York

BETHLEHEM STEEL

"Dated" instruments drain away dollars

Instruments can become outmoded . . . just like automobiles and ideas. Progressive instrument development is constantly making many older designs obsolete . . . and such obsolescence can be a steady drain on profits.

Modern instruments save money

Honeywell engineers are proving this fact every day—in a growing number of plants, on all types of processes. Where out-of-date controls have been replaced by modern Honeywell instrumentation, economy-minded engineers and management men have really opened their eyes. And with good reason, for—

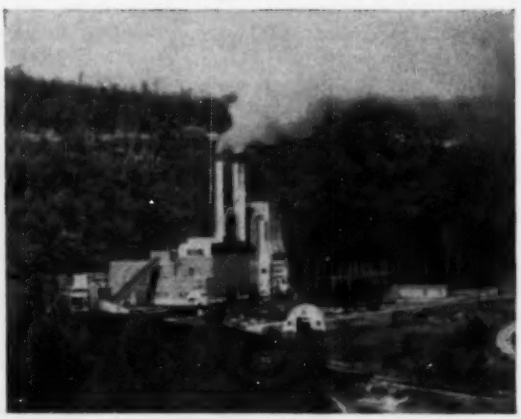
- Modern Honeywell instrumentation saves labor. Centralized control, automatic time-cycle systems, and other recent control concepts save countless wasted steps . . . reduce routine man-hour expenditures.
- Modern Honeywell instrumentation cuts maintenance costs. It affords longer, uninterrupted operation . . . is designed for easy service . . . requires minimum attention.
- Modern Honeywell instrumentation reduces rejects. It maintains the tighter process tolerances demanded by today's more exacting specifications.
- Modern Honeywell instrumentation improves product quality. Precision measurement and control remove any chance of error or guesswork in critical processes.
- Modern Honeywell instrumentation makes cost accounting more accurate than ever before. Everything is a matter of record.

An investment that really pays off

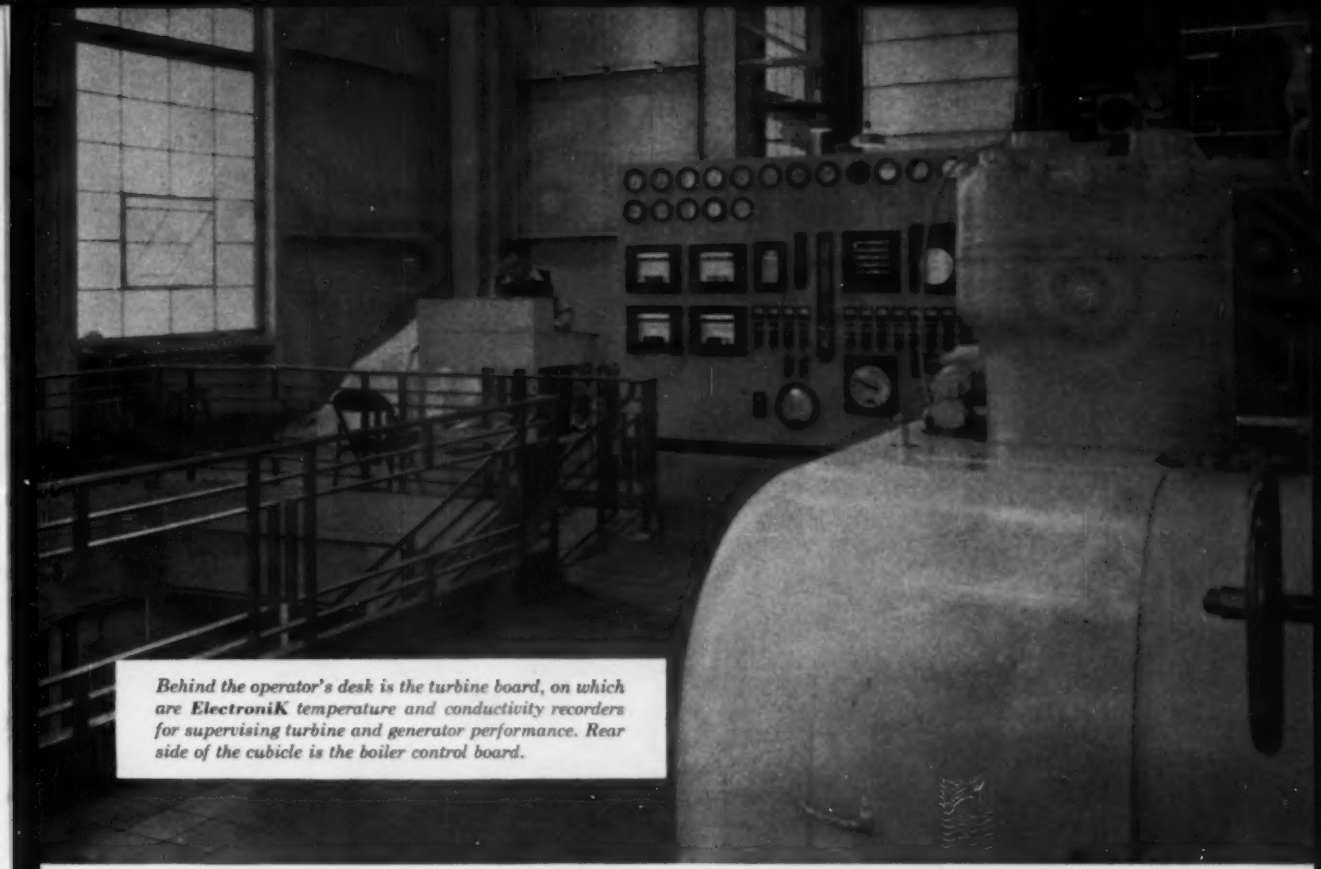
Just being "instrumented" is not enough. You can get more out of your instrument dollar, from both a product and service standpoint, with Honeywell instrumentation . . . the ultimate in engineering and design . . . insurance for your equipment investment.

Replacing with Honeywell is one of the best ways to invest your modernization appropriation. A Honeywell application engineer will gladly survey your present plant instrumentation . . . give you a practical recommendation that will make dollars and sense. Give him a call . . . he's as near as your phone.

Brown instruments supply vital data for operating 75-MW



General view of Kentucky Utilities' Tyrone Station. The 75-MW unit described here represents over half of the generating capacity of the station.



Behind the operator's desk is the turbine board, on which are ElectroniK temperature and conductivity recorders for supervising turbine and generator performance. Rear side of the cubicle is the boiler control board.

unit at Tyrone Station

MODERN INSTRUMENTATION TECHNIQUES have been utilized fully in the fourfold expansion that has taken place since the war in the total capability of the Kentucky Utilities Company. Typical of this trend is the control for the latest 75 megawatt unit added to the Tyrone Station (station design by Sargent & Lundy). The unit is equipped with comprehensive Honeywell instrumentation that gives operators centralized supervision of variables affecting safety of equipment and efficiency of output.

Boiler and turbine boards are mounted back-to-back on a single cubicle. On the turbine board are *ElectroniK* multi-point instruments which record temperatures of generator and turbine bearings, oil coolers, hydrogen coolers, condensate in hot well and heaters, and throttle steam. To keep watch on generator heating, an *ElectroniK* recorder charts temperatures at selected spots in the stator winding, and a single record instrument records rotor temperature. Another *ElectroniK* instrument provides a continuous check on condensate purity. All these instruments are equipped to actuate annunciators in the event that preset safe limits are reached.

Similarly, the boiler operating board includes *ElectroniK* instruments for recording steam conductivity as a means of preventing carryover and turbine damage . . . for checking heat-balance temperatures in preheaters, economizer, etc. . . . and for controlling recirculation of air through the preheater to guard against moisture condensation.

Your local Honeywell sales engineer will be glad to work with you and your consulting engineer on the application of this versatile line of instruments to your specific plant problems. Call him today . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.

● **REFERENCE DATA:**
Write for Bulletin 90-2, "Supervisory Instruments for Power Generation."

MINNEAPOLIS
Honeywell
BROWN INSTRUMENTS

First in Controls

Investigate--

RICHARDSON-ALLEN
SELENIUM RECTIFIERS
FOR ABSOLUTELY
Dependable
Industrial D-C

- Precision engineering
- Thermal protection against excessive heat
- Positive feed-back control
- Self-contained units
- Basic units for parallel hook-up
- Fused on a-c and d-c sides
- Practically no upkeep
- Nothing to renew
- Sealed fan bearings, when used, never need oil
- Easy to install
- Easy to move if necessary

write for descriptive literature

RICHARDSON-ALLEN CORPORATION
a manufacturing affiliate of
WESLEY BLOCK AND COMPANY
39-15 MAIN ST., FLUSHING, N. Y.
IN CANADA: Richardson-Allen of Canada, Ltd.
370 Victoria St., Toronto, Ont.

CATALOGS · BULLETINS

● **COUPLINGS:** Bulletin 4838 (4 pages) gives installation and maintenance instructions for spacer-type flexible shaft coupling. Also explained are the features which make it suitable for installations that require more than normal gap between connected shafts. The Falk Corp, Milwaukee, Wisc.

● **LUMINOUS CEILING:** A 16-page brochure entitled "Acousti-Luminus Ceiling—The Ceiling That Works For You!" describes and illustrates the new ceiling, its savings, its efficiency and its quality. Lum'nous Ceilings Inc, 2500 W. North Ave, Chicago, Ill.

● **LIFT TRUCKS:** A 24-page booklet (Form 1214) describes lift truck operation, preventive maintenance, safety, and basic materials handling. Hyster Co, Portland 8, Oregon.

● **RUST PREVENTION:** A 24-page catalog, Form No. 254, describes a line of rust prevention products. Included are instructions for surface preparation and application of primers, machinery and implement finishes, chemical and heat resistance types, sealers, oil field finishes, thinning oils, and floor and masonry coatings in various colors. Rust-Oleum Corp, 2799 Oakton St, Evanston, Ill.

● **PUSH BUTTONS:** Bulletin GEA-5779B, 16-pages, describes a line of oil-tight push buttons, selector switches, and accessories. Applications, ordering instructions, dimensions and outlines, and contact ratings of units are included. General Electric Co, 1 River Rd, Schenectady 5, N. Y.

● **QUALITY CONTROL:** A 4-page folder entitled "Norelco Autrometer" describes with photos and diagrams, the principle and operation of an instrument for automatic quality analysis of incoming raw materials, constitutents in various stages of combinations, and the finished products. North American Philips Co, Inc, Mount Vernon, N. Y.

● **SMOKE CONTROL:** A 28-page bulletin describes the general principals of electrical precipitation and its chief applications. Installation photos and diagrams of equipment are included. Research-Cotrell Inc, Bound Brook, N. J.

● **NEOPRENE: The "Neoprene Notebook"** describes thermal properties of rubber compounds and shows various neoprene applications. E. I. du Pont de Nemours & Co, Wilmington, Del.

● **SWITCHES:** Bulletin No. 522 gives ratings and dimensions of hook- and gang-operated, rural disconnect switches. Ratings are: 200 amp, 7.5 to 34.5 kv; and 200 and 400 amp, 7.5 and 15 kv. . . . Bulletin No. 532 covers outdoor hook-operated switches rated 400, 600, 1200, and 2000 amp. for 7.5 to 69 kv. operation. Memco Engineering & Mfg. Co, Inc, Commack, L. I., N. Y.

● **TRANSFORMERS:** Bulletin 61B7309B tells how protected distribution transformers help utilities. Operating advantages, mechanical data, and a typical load-time curve are given for ratings of 3 to 100 kva, 2.4 to 14.4 kv. Allis Chalmers Mfg. Co, 932 S. 70th St, Milwaukee, Wisc.

● **METER TESTING:** Bulletin No. 74 describes the Type RC-50 Artificial Load for field testing watthour meters separately or with demand attachments, reactive meters or loss compensating devices. Eastern Specialty Co, Philadelphia 40, Pa.

● **LIGHTING:** A 20-page booklet, B-4556-B gives basic requirements for school lighting systems and describes lighting systems which satisfy these requirements. It discusses new installations and relighting projects. Westinghouse Electric Corp, Box 2099, Pittsburgh, 30, Pa.

● **CIRCUIT BREAKERS:** Bulletin 71B7946A gives design features, operator mechanism, ratings, dimensions, and weights of Types 0Z-15-100, 0Z-15-250, and 0Z-23-250 power oil circuit breakers. Breaker ratings are: 14.4 kv, 100 mva; 14.4 kv, 250 mva; and 23 kv, 250 mva. Allis-Chalmers Manufacturing Company, 932 S. 70th Street, Milwaukee, Wisc.

● **WORM GEARS:** Engineering Manual SW No. 1 gives ratings and specifications for worm gear sets with ratios from 4½ to 71 for application in equipment with shock load or uniform load characteristics. Foot Bros Gear and Machine Corp, 4545 S. Western Ave, Chicago, Ill.

● **MOTOR CONTROLS:** Booklet No. 5411, 46-pages, contains photos and specifications of magnetic starters and contactors, push buttons, combination starters, drum controllers, master, foot, limit and pressure switches. Furnas Electric Co, 1026 McKee St, Batavia, N. Y.

● **SCALE MODELS:** A 4-page brochure "Models for Production Lines" describes uses and cost of scale models for machine shops, assembly lines, and office layout. Industrial Models, Inc, 2311 Sconset Rd, Wilmington 3, Del.

● **MICROWAVE:** An 8-page booklet, B-6993, describes applications for 2000-mc microwave-radio systems. Frequency division multiplexing, crystal frequency control, standby equipment and maintenance features of Type-FR microwave radio and Type--FJ multiplexing equipment are discussed. Westinghouse Electric Corp, Box 2099, Pittsburgh, Pa.

● **ALUMINUM BUS CONDUCTORS:** A 12-page brochure details advantages and methods of joining and bending aluminum bus conductors. Contains tabulated information on thermal, electrical and physical properties, dimensions, weights, and tolerances for various shapes, alloys and sizes of bus conductors. Specific engineering information is given for each type of bus conductor in the available alloys. Industrial Service Division, Kaiser Aluminum & Chemical Sales, Inc, General Sales Office, Palmolive Building, Chicago 11, Ill.

● **TRUCK EQUIPMENT:** Bulletin No. 617 describes a line of public utility truck equipment. Included are: allsteel truck bodies; self storing derricks; winches; truck powered pole hole diggers; single-lever, non-clutching transmissions; power take-offs; pole trailers; ground rod drivers and special truck equipment. Tel-E-Lect Products, Inc, 10,0001 Minnetonka Blvd, Minneapolis 16, Minn.

● **CIRCUIT-BREAKERS:** Bulletin 726-100 describes 5 and 15-kv. class replacement units for obsolete breakers of insufficient interrupting capacity. Drawout assemblies have breaker ratings of 50 to 500-mva. for 2,300, 4,160, 4,800, 7,200, and 13,800 v operation. Continuous current ratings are 600 to 1600 amps. Nelson Electric Mfg. Co, 217 North Detroit, Tulsa, Okla.

● **WATER CONDITIONING:** Publication No. 4567 discusses chloride anion exchange, why it is necessary to dealkalize boilerfeed and processing water, and shows how water can be dealkalized. Cochrane Corp, 17th St. and Allegheny Ave, Philadelphia 32, Pa.

● **ALUMINUM:** A 16-page brochure contains a wrought aluminum alloy and a casting alloy selection guide which outlines general properties and applications of various aluminum mill products. Methods of fabricating and finishing are explained. Reynolds Metals Co, 2500 S. Third St. Louisville, Ky.

BOOKS

Water Treatment Systems

Water Conditioning for Industry—1st Edition. By S. T. Powell. Published by McGraw-Hill Book Co, New York 36, N. Y. 548 pages, illustrated. Price $9.00.

This book offers an up-to-date treatment of all effective water-conditioning methods. Although methods covered have wide application in many industrial fields, emphasis has been placed on preparation of water for high-pressure boilers. All of the methods are approached from two viewpoints—the theoretical and the practical. The theoretical treatment covers basic chemistry of the problem and its solution. It is, however, presented in as non-technical a form as possible. The practical treatment covers actual operating equipment and is supplemented with numerous illustrations and schematic diagrams.

Other chapters cover corrosion of metals, corrosion problems in high-pressure boilers, electrolytic processes for corrosion control, and chemical cleaning of power plant equipment. Each chapter concludes with a selected bibliography amplifying the subject under discussion. This bibliography contains not only pertinent textbooks but also important articles from technical magazines. The comprehensive coverage of the material makes the book valuable to engineers responsible for the design and operation of central station power plants.

Architect's Guide

Mechanical and Electrical Equipment for Buildings. By (the late) Charles Merrick Gay, Charles De Van Fawcett, and William J. McGuinness. Published by John Wiley & Sons, Inc., New York 16, N. Y. 564 pages, illustrated. Price $8.50.

A revised version of the 1945 edition, this expanded book is directed to the architectural student who must include water distribution, sanitation, heating plants, air conditioning, electrical machinery, and acoustics in his plans.

Industrial power salesmen may find the chapters on electrical equipment and lighting helpful when attacking new problems for their customers. Although this is not an engineering book, some basic data and mathematical techniques are given.

Advanced practices are outlined in the selection, installation, operation and maintenance of mechanical and electrical equipment. Modern equipment has replaced the older types, and a chapter on radiant heating has been added. The elements of electricity are explained. Tables dealing with selection and application of wires, insulation, and conduit sizes have been checked with the 1953 National Electrical Code. New text material covers design of elevator lobbies and escalator entrances and passageways.

"Even wit my eyes shut
I can still see dat barbed wire!"

● For many years, Cyclone Chain Link Fence has been dashing the hopes of expert criminals; until today it is the most widely used property protection fence in the world. Although it is primarily designed for protection, Cyclone gives you the additional benefits of long service life and neat appearance.

You can buy cheaper fence than Cyclone, but it will cost you more per year. Cyclone gives full value for your dollar. Nothing but brand-new, top-quality material is used throughout. Posts and top rails are heavy and rigid. Gates won't drag. And when Cyclone Fence is erected by full-time, Cyclone-trained experts your fence will stay trim and good-looking for years.

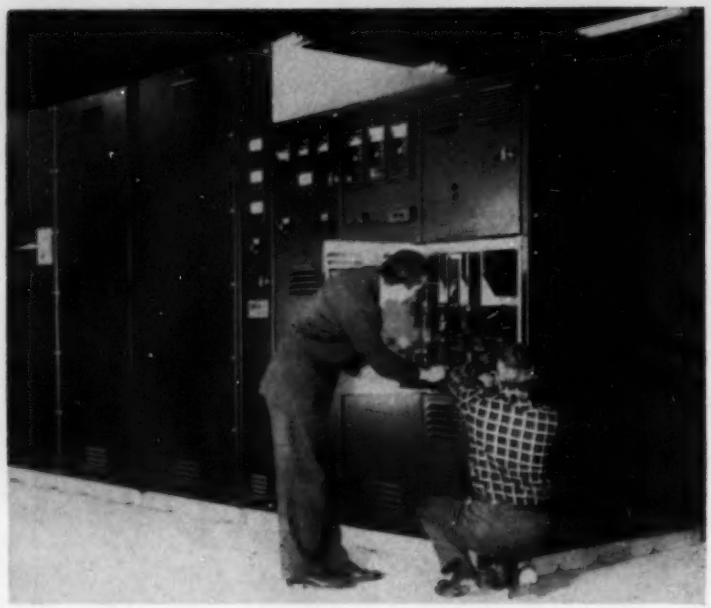
NO JOB IS TOO LARGE—NO JOB IS TOO SMALL FOR CYCLONE*

CYCLONE FENCE DEPARTMENT, AMERICAN STEEL & WIRE DIVISION
UNITED STATES STEEL CORPORATION
WAUKEGAN, ILLINOIS · SALES OFFICES COAST TO COAST · UNITED STATES STEEL EXPORT COMPANY, NEW YORK

Cyclone Fence, Dept. V-35, Waukegan, Ill.
Please send me without obligation, complete information on Cyclone Fence and Gates.
Name.....
Address.....
City.....State.....

*Cyclone is the trade-mark name of fence made only by Cyclone. Accept no substitute.

USS CYCLONE FENCE
UNITED STATES STEEL



Roller-Smith to Ship 26 Substations

Unit substation and enclosed switchgear are being produced in quantity lots by Roller-Smith Corp, Bethlehem, Pa. On one order a total of 26 substations will be shipped to various Fisher Body Division plants of General Motors Corp. Each substation consists of: A high-voltage fused load interrupter switch; a Class H nitrogen-filled 1,500 kva transformer (15 or 4.8 kv primary, depending on location; 480-v, 3-ph secondary); a 3,000-amp (75,000 amp IC) electrically operated, drawout type, main circuit breaker with overcurrent and reverse current relay protection for looped primary and secondary circuits, two 1,600-amp (50,000 amp IC) manually operated, drawout type, feeder circuit breakers; and space for a third feeder breaker.

Enclosures appear to have a black finish. This is due to the Spraylat coating used to protect the permanent gray finish during shipment and installation. The protective coating is readily removed by peeling.

American Brass to Build Aluminum Mill

American Brass Co, wholly owned subsidiary of Anaconda Copper Mining Co, will soon construct an integrated aluminum mill on a 315-acre site in Otter Creek township, about four miles north of Terre Haute, Ind.

As soon as the company's engineering department can complete the planning, ground will be broken for the new mill which, together with a separate office building, will cover 500,000 sq ft. Construction cost will be approximately $25 million. Plant operation is expected to support about 1,000 people.

Wilbur Jurden, chief engineer of Anaconda Copper Mining Co, will have supervision of the building program. James F. Ackerman, vice president of American Brass Co will be in charge of the new aluminum fabricating operation at Terre Haute.

Ingot aluminum requirements of American Brass Co and Anaconda Wire & Cable Co will be obtained from Anaconda Aluminum Co. The latter started construction of a new aluminum reduction plant at Columbia Falls, Mont., in 1953. This plant will be completed about the middle of this year. Eventually it will attain an annual production of 60,000 tons of ingot aluminum.

83,000-Hp Motors

. . . produce air speeds up to 3,800 mph for transonic and supersonic wind tunnels

The world's two most powerful motors (each 83,000 hp) were given their official "start-up" late in January. Installation is at the Air Research and Development Command's Arnold Engineering Development Center, Tullahoma, Tenn, ARDC headquarters announced.

These giant synchronous motors will operate the U. S. Air Forces new transonic and supersonic propulsion wind tunnels at AEDC. The latter tunnel is designed to produce air speeds up to 3,800 mph. for testing jet planes and guided missiles.

Two 25,000-hp induction motors were used to start the synchronous motors and accelerate the rotating mass to its rated 600 rpm. Each 83,000 hp motor weighs 225 tons.

The four motors will be connected in tandem to five large compressors, one for the transonic tunnel and four for the supersonic tunnel. Motors and compressors are Westinghouse products. Transonic compressor will be installed about middle of the year, the supersonic compressors at a later date. Complete installation will be almost as long as two football fields.

Despite the tremendous weight and speed, the motor and compressor system can be brought to a halt in about three minutes by using the wound-rotor motors as brakes. The energy is dissipated in liquid rheostats which are used for secondary controls.

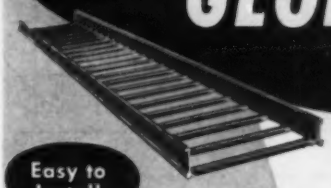
Battelle Institute to Get A 1,000-Kw Reactor

One of the first nuclear reactors in the U. S. to be owned and operated by a private organization has been ordered by Battelle Memorial Institute, Columbus, Ohio. It will be a key component in a $1.5 million research center about 15 miles west of Columbus. Dr. H. R. Nelson, director of Battelle's Department of Physics will be in charge of the atomic research laboratories.

(*Continued on page* 174)

a new, superior system of CABLE and TUBING race ways

GLOBE'S CABLE WAY



Easy to Install

Saves Time

Galva-nized

Saves on Material

No Maintenance problem

A completely engineered system of cable ways, production produced and die formed for uniformity with up to twice the strength of ordinary trays, by actual laboratory tests. The universal splice plate joins all parts through the side channels only. All curved fittings are joined at the end of the radius (no tangent material is required) permitting continuous curves. This feature provides greater flexibility of application in tight places and creates an endless variety of combinations for a simple solution to any design problem of change of direction or elevation with a complete set of standard fittings.

Comes in 6″, 12″, 18″ and 24″ widths, in standard 12′ lengths to further speed up installation time. Cable way can be cut to length at any point—insides and bottom always smooth—all sections punched for easy installation—perfect fit at all times. Neat, clean and uniform in appearance.

Write for new complete catalog.
Distributors in all principal cities.
Contact the Grip-Strut distributor under "Grating" in the Classified Telephone Directory.

THE GLOBE COMPANY
Manufacturers since 1914
4000 S. Princeton Ave. • Chicago 9, Illinois

Globetray
PAT. PENDING
THE GLOBE COMPANY
CHICAGO 9, ILLINOIS

DESIGNED for quick, low cost trench digging for foundations and all types of service lines.

LADDER type permits efficient operation in the closest quarters and under difficult conditions.

CUTS up to 5 ft. in depth in 8" to 12" widths; 4 ft. in 14" and 16" widths; straight and clean.

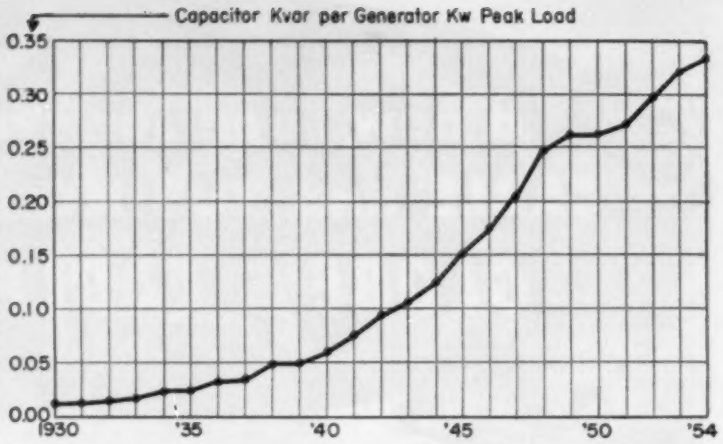
THE NEW BUCKEYE 403

For Fast, Low Cost Utility Ditching

The 403 is a small, easy-to-maneuver machine for digging water, gas, sewer, building foundations . . . Low bearing electric or telephone lines and for pressure to avoid damage to lawns or walkways . . . Easily transported from job to job and will travel over almost any type ground. Digs a clean, straight-sided trench with squared corners. Complete details from your distributor.

No. 5512

GAR WOOD INDUSTRIES, INC.
WAYNE, MICHIGAN



KVAR OF CAPACITORS installed per kw of peak load for 1930 through 1954. Basis is total of power factor capacitors installed on both utility and industrial systems but does not include capacitors which are part of actual equipment such as in room conditioners.

Capacitor Ratio Rose To 0.33 in 1954

Another significant milestone in the application of power factor capacitors was reached in 1954 when the national ratio of capacitor kvar installed per kw of peak load rose to 0.33, according to A. E. Peltosalo, Manager of Marketing Research and Product Planning for the General Electric Co's Capacitor Department. It can be seen in the curve that this index of capacitor installations has gone from 1 per 100 (0.01) in 1930 to 1 per 3 (0.33) in 1954.

In general, utilities are installing fixed capacitors up to ratios between 0.20 and 0.30 depending upon their systems. To achieve higher ratios, switched capacitors are utilized. Mr. Peltosalo indicates that from an application standpoint 1954 showed more emphasis on using residential secondary capacitors for fixed kvar requirements and pole top automatically switched capacitors for the switched kvar requirements. Also 1954 saw more utilities becoming interested in the use of capacitors on underground secondary networks.

Mr. Peltosalo indicates that economic studies show that nationally the ratio of capacitor kvar per kw of peak load will reach 1 for 2 or 0.50 in the next 10 years. Many utilities, particularly in the south where the peak load with its lower power factor occurs in the summer, already have ratios ranging from 0.40 to 0.60. "We are finding more and more utilities who are planning for kilovar requirements today in the same manner they plan for their kilowatt requirements" reports Mr. Peltosalo. He indicates a number of utilities as a matter of practice now install 1 kvar for every kw of new load appearing on their system.

Battelle Reactor

(*Continued from page* 172)

Contract for the design, engineering and construction of the reactor has been awarded to the American Machine Foundry Co, New York. This reactor will be the "swimming-pool" type and be designed to operate at about 1,000 kw on uranium-235 fuel.

The reactor will be modeled somewhat after the bulk shielding reactor at the Oak Ridge National Laboratory. Its core will be similar to that in the materials testing reactor at the National Reactor Testing Station in Idaho.

Tape Council Activities

At the second annual meeting of the Pressure Sensitive Tape Council held at White Sulphur Springs, W. Va., officers elected were — President, Clarence I. Lee, president of Hamp-

(*Continued on page* 176)

COULD YOU LEARN TO CARE ABOUT...

power factor?

"I'm Mortimer Magnetizer. I care!"

"Mortimer Magnetizer is my name. Nobody has ever actually seen me, but anywhere electric motors are being used I get a powerful lot of work done!

"What I do is really simple—I set up the magnetic fields in the motors, and until I get going nothing much happens in your plant.

"Now, that's all well and good. I like my work. But it's the *Power Factor* business that bothers me. Because of *low* power factor in many plants, I get a lot of blame that's really not my fault. Honestly.

"You see, many plants use a goodly number of induction motors, and I like to magnetize them . . . they're hard workers. But unfortunately the reactive kva which I must have to magnetize is not produced by an induction motor. Instead, I must draw it from the main power system, and in a plant full of induction motors I can really 'overdraw' my account!

"This means the incoming power system must carry *two* things—*kilowatts* for useful work by the motors, and plenty of *reactive kva* for my magnetizing. The more of the latter, the less of the former, and brother, that's *low* power factor. It's expensive, because the 'deadhead' reactive kva can't do the work you want done, and yet you pay for it.

"What's the answer? Why, it's simple. The answer is Synchronous Motors. Use them wherever possible! They not only supply their own reactive kva for my magnetizing, but they can even be designed to supply extra or 'leading' reactive kva to offset kva demands elsewhere on the line.

"Now here's Utopia for me! When you use Synchronous Motors to supply reactive kva, you can reach a glorious state called UNITY, in which no costly reactive kva is required from the power system. Brother, that's *high* power factor, and that's how I work best!

"Where to go for Synchronous Motors and expert help on their applications? Go to E-M, of course. E-M pioneered the use of Synchronous Motors . . . E-M engineers know them and their applications from A to Z. And, naturally, Power Factor Improvement is a specialty at E-M.

"They've put all the answers into the practical, informative book shown at left. And ask your E-M sales engineer for helpful suggestions. He knows me, I know him. We work well together!"

GET THIS NEW SLANT ON POWER FACTOR

Here's a brand new 32-page, 3-color, highly illustrated story of Synchronous Motors, and how to use them for power factor correction. Write for your free copy of 42B.

ELECTRIC MACHINERY MFG. COMPANY
MINNEAPOLIS 13, MINNESOTA

E-M

200-TPA-21428

***Specialists in making motors do* EXACTLY WHAT YOU WANT THEM TO**

IN THE FIELD as in laboratory tests . . . **Crapo** Galvanized Steel Strand proves itself capable of withstanding severe punishment. Steel's inherent strength and durability are combined with definite economies in every size and grade of **Crapo** Steel Strand. You'll find the heavy, ductile, tightly-bonded zinc coatings, applied by the famous **Crapo** Galvanizing Process, provide lasting protection against corrosion.

Contact your jobber of Crapo Galvanized Products or write direct for further information!

INDIANA
STEEL & WIRE COMPANY
MUNCIE, INDIANA

Keep Your Lines Clear

Sailors know the importance of "keeping the lines clear"—and so do we! We know it's costly and time-consuming to clear brush from transmission lines—by ordinary means. We use helicopters: it's quicker and cheaper; complete coverage insures optimum kill. Our patented brush-killer goes right to the roots. Contact us today—let us show you how we can "keep your lines clear" at less cost to you.

STULL'S
Chemicals
3400 Nacogdoches
P. O. Box 6722 San Antonio 9, Texas

Tape Council

(*Continued from page* 174)

ton Manufacturing Co; vice president, John M. Cook, vice president of Behr-Manning; Secretary-Manager and Treasurer Richard G. Breeden, Jr, continues. The Council's headquarters are in Glenview, Ill.

Technical and Specifications Committee has been working on standards in nomenclature and test methods of pressure sensitive tape characteristics common to the industry. Also, a glossary of terms is being prepared for publication at a later date.

MANUFACTURING BRIEFS

Globe Lighting Products Inc has broken ground for a 10,000-sq ft extension to its Brooklyn, N. Y. plant. This warehouse addition will bring to 270,000 sq ft the total area in a three-block square plant for the manufacture of residential lighting fixtures.

Integrated Mica Corp, Woodmere, N. Y. has completed the design of new equipment to manufacture more economically paper-thick sheets of overlapping mica flakes.

A. B. Chance Co located in Centralia, Mo., is establishing the A. B. Chance Co of Canada, Ltd, with general offices in Toronto, according to F. G. Chance, president of the U. S. firm. Mr. Chance will also serve as president of the Canadian organization. W. H. White of Toronto has been named executive vice president.

Forest Products Treating Co of Laramie, Wyoming, and division of Nebraska Bridge Supply and Lumber Co, will make pentachlorophenol wood preservative available for the first time in Wyoming about March 1, according to George L. Barkhurst, assistant general manager of Forest Products . . . **Minerals Processing Co** of La Grange, Ga., reports that one of the biggest "strikes" in the recent history of mica-mining has been made in the southwestern corner of North Carolina near Cowee Township . . . **Permacel Tape Corp** has opened a 11,000-sq ft warehouse at 615 Livernois Ave, Ferndale, Mich., six miles from Detroit.

SALES ASSIGNMENTS

COMPANY STAFFS

Line Material Co, Milwaukee, Wis., has made these appointments: Charles C. Allen to become lighting engineer in company's West Coast division and C. J. Carter to be made fibre products sales engineer. Allen will be working out of L-M's Los Angeles office and representing company in southern California. Carter will work out of Spokane, Wash., and will cover Washington, Oregon, Idaho, Montana, Wyoming, Colorado, Utah, part of Nebraska, and Alaska.

Electric Controller & Mfg Co, Cleveland, Ohio, has appointed Donald H. Dodt as Cleveland district manager.

Federal Pacific Electric Co, Newark, N. J., has named William E. Connor manager of electric utility sales for the Middle Atlantic sales region.

Westinghouse Electric Corp, San Francisco, Calif., has made William T. Michael Arizona apparatus manager with headquarters at 1102 N. 21st Ave., Phoenix, Ariz. Company also made J. H. Reeves, Jr, manager of the newly created Carolinas District offices in Charlotte, N. C.

Allis-Chalmers Manufacturing Co, Milwaukee, Wis., has named James G. Winnette manager of Peoria district.

Minneapolis-Honeywell Regulator Co has made these appointments: Arnold Challman to the newly created position of administration assistant to Manager T. S. Carley in company's regional sales and service office in Chicago; R. C. Ferguson to manage the Peoria branch office while R. R. Scott will be new manager of the Davenport office. Company has established new sales and engineering offices in Phoenix, Ariz., Charlotte, N. C., and Denver, Colo. Ralph C. Froehlich heads the Phoenix office; Donald S. Schultz will take charge of Charlotte office, and R. J. Petersen will be in charge of Denver office.

Diamond Power Specialty Corp, Lancaster, Ohio, has designated Herman Krapf as manager of its Chicago district office.

Sylvania Electric Products Inc, New York, has made these appointments: William C. Lounsberry, Jr, sales manager of the Kansas City district; William L. Stiers district manager, lighting sales, for the Chicago district, and Richard M. Smart Midwest regional sales engineer.

REPRESENTATIVES

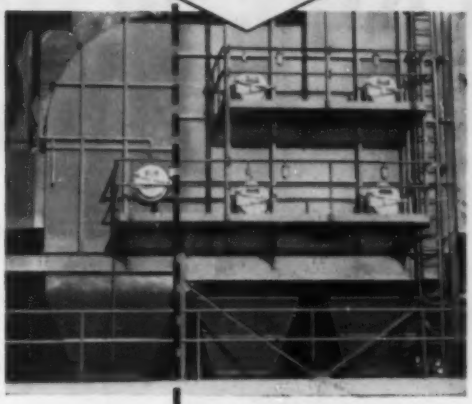
Delta-Star Electric Division of H. K. Porter Co, Inc, has appointed Arnold-Rudbeck, Inc, field representative in Indiana. New representative will cover the territory formerly assigned to the late C. E. Chatfield and will be located at 503 Illinois Building, Indianapolis 4, Ind.

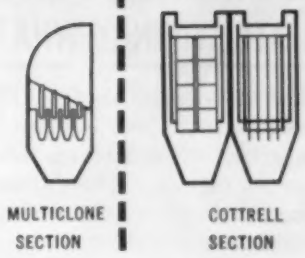
Penn-Union Electric Corp has designated John E. Elggren Co as its sales representative in Utah, eastern Nevada, eastern Ohio and western Colorado.

Roller-Smith ElectricalSwitchgear has made the following appointments: Hosmer R. Kimball Co, 176 Federal St., Boston, Mass., to cover the New England district and W. W. Jackson Co, Southbury, Conn., to cover the Connecticut district.

The Western Precipitation CMP Unit

...its advantages to PUBLIC UTILITIES





Inasmuch as most public utility power generating plants are located in or adjacent to metropolitan areas, the control and recovery of fly ash from stack gases is a particularly important problem. To assist power plants in solving this problem Western Precipitation pioneered, almost a half century ago, the first commercial application of the now-famous Cottrell Electrical Precipitator—and this type of equipment is still universally recognized as outstanding in its field.

Some years later, Western Precipitation also pioneered the first small tube *mechanical* recovery equipment—the Multiclone Collector—to provide high recovery efficiency at low installation cost.

And as a result of these years of firsthand experience in *both* electrical and mechanical recovery methods, Western Precipitation subsequently introduced the CMP unit—fly ash recovery equipment that combines in *one* integrated unit the advantages of both electrical and mechanical recovery principles.

- The CMP first passes the stack gases through a Multiclone section where the heavier fly ash particles are *mechanically* removed.
- Then the partially-cleaned gases pass through a Cottrell section where the very fine fly ash particles are *electrically* recovered.

RESULT—by using a Multiclone section to remove all but the finest particles, the bulk of the recovery operation is performed with relatively low-cost equipment. And using a Cottrell for final clean-up insures unusually high recovery efficiency—approaching theoretically perfect, if desired. Thus, very high recovery efficiency is obtained at low installed cost.

With CMP equipment, even small utility companies can afford adequate fly ash recovery installations. But, large or small, the vital factor in making an efficient CMP installation is obtaining the proper balance between the mechanical and electrical sections to fit the particular requirements of *each individual* application.

This requires actual field experience—and no other organization can equal Western Precipitation's years of first-hand experience in *both* mechanical and electrical recovery methods... your assurance of maximum satisfaction when you bring your fly ash problems to this long-established organization.

Write for full details on Western Precipitation CMP equipment—or contact our office nearest you.

Western Precipitation Corporation

DESIGNERS AND MANUFACTURERS OF EQUIPMENT FOR COLLECTION OF SUSPENDED MATERIALS FROM GASES & LIQUIDS

Main Offices: **1004 WEST NINTH STREET, LOS ANGELES 15, CALIFORNIA**

Chrysler Bldg., New York 17 • 1 N. La Salle St. Bldg., Chicago 2 • 3252 Peachtree St., Rd., Atlanta
Hobart Bldg., San Francisco 4 • Precipitation Co. of Canada, Ltd., Dominion Sq. Bldg., Montreal

FREE! 50 copies of this new Home Wiring Booklet!

(BULK ORDERS $5.00 PER 100)

Now . . . at low cost . . . you can tell every one of your homeowner-customers the vital story of

ADEQUATE WIRING—WHAT IT IS—WHY IT'S NEEDED—HOW TO GET IT!

Here, packed in 16 pages, are the ABC's of the adequate wiring story that's so vital to your business today. It's told in a highly interesting, extremely readable manner. It's plentifully illustrated with numerous cartoons. There's been nothing quite like this booklet since inadequate home wiring became a major problem to the electrical business!

POPULAR!

Here's a booklet that's *really* getting attention! Its first edition of thousands was exhausted three weeks after coming off the press. A big third edition is fast being depleted by new orders and reorders. The response has been truly surprising!

AUTHORITATIVE!

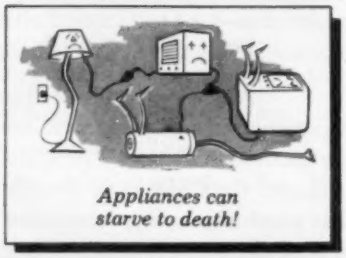
"The ABC of Home Wiring" was written in close collaboration with the National Adequate Wiring Bureau, representatives of public utilities, and leading electrical contractors. You can be *sure* of the data it contains!

A LOW-COST TIE-IN!

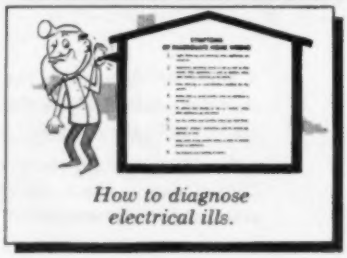
Kennecott offers you this booklet at less than cost. It's part of the national advertising campaign now being sponsored by Kennecott – to the benefit of the entire electrical industry. The first 50 copies are *free of cost to you.* You can order as many more as you need *below cost* . . . only $5.00 per hundred.

Use it for mailings, for giveaways – to spearhead or to supplement your own local adequate wiring promotions. For your copies, send order blank at right.

Has your house outgrown its wires?



Appliances can starve to death!

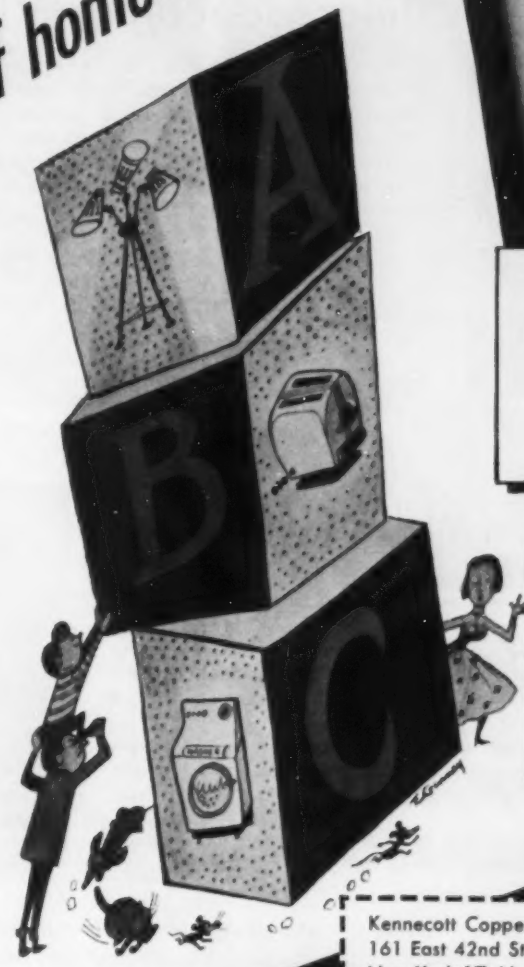


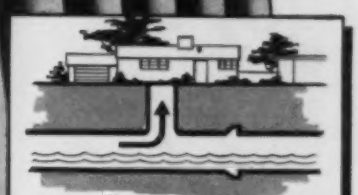
How to diagnose electrical ills.

Kennecott Copper Corporation

Fabricating Subsidiaries: CHASE BRASS AND COPPER CO; KENNECOTT WIRE AND CABLE CO.

the ABC of home wiring





How wires work in your home.

How much adequate wiring costs.

Adequate wiring is an investment!

Kennecott Copper Corporation
161 East 42nd St.,
New York 17, N. Y.

EW-355

☐ Please send me ..... Free copies of your booklet, "The ABC of Home Wiring." (up to 50)

☐ Enclosed is check for $..... payment for..... copies, "The ABC of Home Wiring" at special price of $5.00 per 100.

☐ Please send information on Free Kennecott national ad reprints, poster-sized ad blowups, home wiring wall chart, newspaper mat order sheets.

NAME_____

FIRM_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

SEND THIS ORDER BLANK

for your copies of "The ABC of Home Wiring." First 50 copies FREE; additional copies only $5.00 per hundred. Use the coupon now!

NEWS ABOUT PEOPLE

Billock Becomes VP

George D. Billock has become associated with Hubbard & Co, Pittsburgh, Pa., as vice president and treasurer. He was formerly associated with Latrobe Steel Co as assistant treasurer.

A native of Pittsburgh, Billock is a graduate of the University of Pittsburgh. He attended the Duquesne University Law School. Prior to joining Latrobe Steel Co in 1946, he was assistant to the controller of the National Steel Corp.

Billock is a certified public accountant and is a member of the Pennsylvania Institute of Certified Public Accountants, Controllers Institute of America, American Institute of Accountants, and the National Association of Cost Accountants.

G. D. BILLOCK

Ruehlemann Made Chief Engineer

Herbert E. Ruehlemann has been appointed chief engineer and director of research and development at the Instrument Division of the Roller-Smith Corp, Bethlehem, Pa.

He is a native of Germany and an electrical engineering graduate of the University of Leipzig. In 1926 he entered the field of electrical fuses and later became vice president and general manager of a Breslau, Germany, electrical fuse manufacturing plant.

In 1947 Ruehlemann was brought to the United States by the U. S. Navy to become consultant to the Naval Ordnance Laboratory and was responsible for carrying out all of its research and development in the field of electric fuses.

H. E. RUEHLEMANN

English Heads New Emergency Division

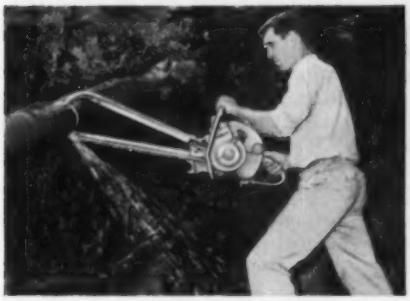
Philadelphia Electric Co has appointed J. A. English as manager of its emergency procedures division, a new unit created to review, improve, and establish new emergency operation procedures. Previously he was superintendent of the company's gas department.

A company spokesman, in making the announcement, said "Although Philadelphia Electric has an excellent record in coping with emergency situations, such as those experienced following Hurricane Hazel, it is realized disastrous storms are striking this area with increasing frequency. It was decided, therefore, to create a special division to bring emergency procedures for both electric and gas services under continuous study and to prepare to activate these whenever needed."

J. A. ENGLISH

Bucks logs right on the ground. Fast. Quick. Clean. Jaw-grip spike bites into dirt . . . keeps chain up out of dirt. Spike takes thrust of chain . . . prevents logs from rolling or spinning away.

Plunge-bucking speeds clearing operations. Gets into all kinds of hard-to-reach places. Enables operator to work quickly, but safely, in close quarters and on steep slopes.



NEW
CLEARING ATTACHMENT
FOR HOMELITE CHAIN SAWS

Here is a completely new Homelite development that makes a Homelite One Man Chain Saw an even greater time-and-money-saver. Converts the Model 17 Chain Saw into an *all-purpose clearing tool* . . . quickly, easily.

With this highly maneuverable new attachment . . . driven by the 3.5 h.p. engine of the 22 pound Homelite Model 17 . . . one man can do the work of a whole gang of men using saws and axes. He can fell, buck, and limb all small trees and saplings without bending, stooping or chain binding.

On demonstration after demonstration, men who have used this clearing tool agree that here is positively the best thing yet.

Write for a free demonstration.

Manufacturers of Homelite Carryable Pumps • Generators Blowers • Chain Saws

PERFORMANCE · DEPENDABILITY · SERVICE

HOMELITE CORPORATION

6103 RIVERDALE AVENUE • PORT CHESTER, N. Y.

Canadian Distributors: Terry Machinery Co., Ltd., Toronto, Montreal, Vancouver, Ottawa.

C. V. ROSEBERRY

Roseberry Heads New Sales Department

Carroll V. Roseberry has been named manager of the newly formed electric utility and transportation sales department of the Westinghouse Electric Corp.

The new department will carry on work done previously by the electric utility sales department, headed by Roseberry, and the transportation sales department, except that major aviation activities have been transferred to the defense products group.

C. F. Sponsler, formerly manager of the marine and land transportation section of the transportation sales department, has been appointed manager of the transportation section of the new department.

A native of Blackwell, Okla., Roseberry received his bachelor of science degree in electrical engineering from Oklahoma A. & M. in 1934. He came to Westinghouse at East Pittsburgh in 1936.

Sponsler joined Westinghouse in 1939 as a member of the graduate student training course.

PERSONAL BRIEFS

Lester R. Crane has joined Anderson Brass Works, Inc, Birmingham, Ala., as sales manager of distribution equipment. He has been associated with A. B. Chance Co for the past seven years, the last four as manager of sales for switchgear . . . **G. D. Simmonds** has been elected vice president of engineering for the Four Wheel Drive Co. Simmonds, with the firm 26 years, has been serving as director of FWD's Engineering Division since 1950. **H. G. Engel,** a veteran of 32 years' service with the company, has been named special accounts manager of FWD. For the past two years he has been assistant manager of the entire FWD sales staff.

Robert Burr, manager of the industry service department of the National Electrical Manufacturers Association, has been elected president of the National Bureau for Economic Realism, Inc . . . **Donald P. Day** has been appointed assistant treasurer and assistant secretary of the Westinghouse Electric Corp . . . **Edward J. Bennan** was elected president and **Louis J. Cross** chairman of the Board of Jefferson Electric Co to replace James B. Bennan, chairman and president, who died Feb. 10 . . . **Roy E. Burris** has been named manager-quality control in the General Electric Co's gas turbine department . . . **David A. Hinton** has been appointed manager of wire and cable department for the National Electric Products Corp. In his new position, Hinton will be responsible for the coordination of all wire and cable sales efforts with sales personnel and the company's design and production departments.

Bernard J. Jacobson has been elected vice president of Taller & Cooper, Inc . . . **W. A. Marquardt** has been made assistant manager of the D. J. Murray Manufacturing Co of Wausau, Wis . . . **G. T. Morrow,** vice president in charge of sales of Curtis Lighting, Inc, has retired. He has been with the company since 1929.

Pennsylvania Electric Co has made these personnel changes in the Technical Department: **Howard H. Folkenson,** formerly with Gilbert Associates, Inc, of Reading, Pa., has been appointed assistant superintendent of the company's power station construction department. **Irvin L. Phillips** has been named system planning engineer in charge of a new system planning department. He formerly was acting superintendent of the electrical equipment department. **Ralph F. Bovier,** former chief engineer for Northern Pennsylvania Power Co, is Penelec's new system electrical engineer, supervising the electrical engineering and electrical equipment departments.

OBITUARY

William Schmidt, Jr, 72, chairman of the board and former president of the Consolidated Gas Electric Light & Power Co of Baltimore, died on February 18. Schmidt started his business career in 1898 as a clerk in the employ of the Edison Illuminating Co, one of the predecessors of the present company. He was elected executive vice president in 1942, and made president in 1946. In December of the same year he was also elected chairman of the board. In 1950 he declined reelection as president but was reelected chairman of the board.

Fred R. Swanson, 71, manager of the Philadelphia Electric Co's Schuylkill division for almost 50 years, died in Norristown, Pa., on February 20.

Fred H. Brown of Copperweld Steel Co's Wire & Cable Division was killed in an automobile accident during a storm on February 11. He was district sales manager, operating out of Richmond, Va.

R. W. Lamar, 70, the last general manager of the old Tennessee Public Service Co, died in Chicago recently. He was TPS general manager from 1932 when he succeeded the late Fred V. Underwood, until Sept. 3, 1938, when the city of Knoxville, Tenn., acquired the TPS properties.

William H. Gage Sr, 56, power consultant for the Southern California Edison Co, died in Los Angeles, Calif., recently.

MEETINGS CALENDAR

An extended list of coming meetings appears in the last issue of each month.

MARCH

CANADIAN ELECTRICAL ASSOCIATION—Western Zone, All Divisions, Bessborough Hotel, Saskatoon, Sask., March 7-9.

NATIONAL ASSOCIATION OF CORROSION ENGINEERS—Annual Convention, Palmer House, Chicago, March 7-11.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—Farm Electrification Conference, Morrison Hotel, Chicago, March 8-10; Utilization of Aluminum Conference, William Penn Hotel, Pittsburgh, March 15-17.

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION—Winter Meeting, Edgewater Beach Hotel, Chicago, March 13-18.

EDISON ELECTRIC INSTITUTE—Industrial Relations Committee, EEI Headquarters, New York, March 17; 21st Annual Sales Conference, Edgewater Beach Hotel, Chicago, March 28-31.

PUBLIC INFORMATION PROGRAM—Mid-Atlantic Region, Jefferson Hotel, Richmond, Va., March 21.

SOUTHEASTERN ELECTRIC EXCHANGE—Annual Meeting, Boca-Raton Hotel and Club, Boca Raton, Fla., March 21-23.

INSTITUTE OF RADIO ENGINEERS—National Convention, Waldorf-Astoria Hotel-Kingsbridge Armory, March 21-24, New York.

ROCKY MOUNTAIN ELECTRICAL LEAGUE—Electric Meter Institute, University of Denver, Denver, Colo., March 21-25.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Management Conference, Hotel Statler, Cleveland, Ohio, March 23-24.

MISSOURI VALLEY ELECTRIC ASSOCIATION—Engineering Conference, President Hotel, Kansas City, Mo., March 23-25.

OKLAHOMA UTILITIES ASSOCIATION—Annual Convention, Mayo Hotel, Tulsa, Okla., March 24-25.

CONTROLLERS INSTITUTE OF AMERICA—Southern Conference, Mayo Hotel, Tulsa, Okla., March 25-26.

AMERICAN POWER CONFERENCE—17th Annual Meeting, Sherman Hotel, Chicago, March 30-April 1.

ILLUMINATING ENGINEERING SOCIETY—Southwestern Regional Conference, Ft. Harrison Hotel, Clearwater, Fla., March 31-April 1.

APRIL

***ILLUMINATING ENGINEERING SOCIETY**—Southwestern Regional Conference, Gunter Hotel, San Antonio, Tex., April 3-5; Inter Mountain Region Conference, Westward Ho Hotel, Phoenix, Ariz., April 11-13; South Pacific Coast Regional Conference, Statler Hotel, Los Angeles, April 14-15; Pacific Northwest Regional Conference, Harrison Hot Springs Hotel, Harrison Lake, B. C., April 25-26.

ATOMIC INDUSTRIAL FORUM, INC—Meeting on "Atomic Energy—The New Industrial Frontier," jointly sponsored by Stanford Research Institute, Mark Hopkins Hotel, San Francisco, April 4-5.

15TH ANNUAL YOUNG MEN'S UTILITY CONFERENCE—Ipalco Hall, Indianapolis Power & Light Co, Indianapolis, Ind., April 6-7.

PACIFIC COAST ELECTRICAL ASSOCIATION—Joint Conference with Pacific Coast Gas Association, Administrative Services and Accounting Section, Jokane Inn, Phoenix, Ariz., April 7-8.

SOUTHEASTERN ELECTRIC EXCHANGE—Engineering and Operation Section, Roosevelt Hotel, New Orleans, La., April 7-8.

AMERICAN INSTITUTE OF ELECTRIC ENGINEERS—Southern District Meeting, Soreno Hotel, St. Petersburg, Fla., April 13-15.

NORTHWEST ELECTRIC LIGHT & POWER ASSOCIATION—Engineering and Operation Section with Personnel and Safety Section, Davenport Hotel, Spokane, Wash., April 13-15.

ROCKY MOUNTAIN ELECTRICAL LEAGUE—Annual Spring Conference, Shirley-Savoy Hotel, Denver, Colo., April 17-19.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Spring Meeting, Lord Baltimore and Southern Hotels, Baltimore, Md., April 18-21.

NORTHWEST PUBLIC POWER ASSOCIATION—Annual Meeting, Eugene Hotel, Eugene, Ore., April 20-22.

AGRICULTURAL AND MECHANICAL COLLEGE OF TEXAS—8th Annual Conference for Protective Relay Engineers, Sponsored by Department of Electrical Engineering, College Station, Tex., April 25-27.

EDISON ELECTRIC INSTITUTE—Industrial Relations Committee, EEI Headquarters, New York, April 21; Meter and Service Committee, Washington-Duke Hotel, Durham, N. C., April 25-27.

CONTROLLERS INSTITUTE OF AMERICA—Eastern Conference, Royal York Hotel, Toronto, Ont., April 28-30.

---

*Additions this week

Best Transformer Sizes

(*Continued from page* 92)

In each of these instances the effect at lower rates of load growth would be even less than that cited for 25% load growth. Thus a break-even curve based upon adjusted costs tends to converge with the corresponding curve of Figs 1 and 2. The two curves would, in fact, converge at the horizontal, or 0% rate of load growth, axis.

Positions of the curves are affected considerably by allowable maximum transformer loading. This loading influences both the slope of a curve and the point that it crosses the horizontal axis. For allowable loadings different from 150%, curves similar to those in Figs 1 and 2 can be constructed. Points for such curves can be closely approximated by multiplying the loads on the illustrated curves by the ratio of the desired percentage allowable loading to 150%.

Use of Charts . . . The charts can be used as aids in selecting the proper transformer size for a given location but should not be used as the sole basis for selection. They compare only transformer annual charges, load testing expenses, and change-out costs. While these are major economic factors, there are several others that should be taken into consideration. Operating conditions at each location must be considered also.

Use of the charts requires an estimate of the peak transformer loading during its first year of operation and an estimate of the rate of load growth. The initial load estimate can be made from a summation of connected load and the application of proper diversity factors. Another method, in the case of transformer replacements, is to use an actual load test and multiply by a seasonal factor. These seasonal multipliers are shown in Fig 3.

The rate of load growth estimate is a prediction of the average rate at which the load will grow during the next few years. In areas saturated with customers, the rate of load growth should be about 8% per year, the average annual increase in kwhr consumption per residential customer. In areas where new customers come on existing transformers from time to time, maximum rate of load growth is about 25% per year. Usual cases

(*Continued on page* 184)

Meter Installations *A Cinch!*

with KEES
SOCKET
CINCHER

Kees Socket Cincher saves time and tempers by simplifying socket meter installations . . . eliminates pounding and danger of breakage to glass covers.

With Kees Socket Cincher, you secure the meter into the base firmly and quickly merely by snapping the locking device into position.

A must on every service truck. Reasonably priced at only $2.50 each F.O.B. factory. Subject to freight allowance.

Write for FREE
illustrated literature
P. O. Box 564

"SINCE 1874"

F. D. KEES MFG. CO.
BEATRICE NEBRASKA

A copy of this quick-reading, 8-page booklet is yours for the asking. It contains many facts on the benefits derived from your business paper and tips on how to read more profitably. Write for the "WHY and HOW booklet."

McGraw-Hill Publishing Company, Room 2710, 330 West 42nd St., New York 36, N.Y.

Transformer Size

(*Continued from page* 183)

should fall between these two extremes.

Points Near Curves . . . If the estimated initial conditions are well to the left of the maximum economical initial loading curve of a given transformer size, that size will probably be the most economical. If the initial conditions are within 3% to 5% to the left of such a curve, serious consideration should be given to installing the next larger size. In such instances the sacrifice in transformer annual costs and expenses will be small. They can be more than off-set by:

1. Increased revenue because of a higher voltage level.

2. Postponement of voltage corrective measures such as regulators, permanent boost, and capacitors.

3. Postponement of splitting of secondaries and installing a second transformer.

Coordinate Sectionalizers

(*Continued from page* 99)

Planning Protection . . . Economy dictates that automatic recloser and sectionalizer combinations be first applied where greatest benefits can be obtained in a system with thousands of sectionalizing points. Use of five recloser installation points, covering the operation of seven sectionalizers and 28 fuse-sectionalizing points, as shown in Fig 4, is well above average coverage.

Enough short-circuit must be available even with fairly high fault impedance to assure pick-up of the recloser. Otherwise no coverage can be claimed for recloser protection to the end of the spur beyond a fused sectionalizing point. Operation of the oil circuit recloser at point A in Fig 4 is not claimed for a short circuit in the section covered by the fuse at point B, even though a direct wire-to-wire fault or short with small fault impedance actually causes the recloser to operate. Largely because of this precaution, New York State Electric & Gas has had no report of trouble where a branch line oil circuit recloser failed to pick up when the line was faulted.

(*Continued on next page*)

Variety of Installations . . . The sectionalizer at point C in Fig 4 exemplifies another type of installation. In this instance it was not possible to coordinate a line sectionalizing fuse between the largest transformer fuse in the spur line D and the branch line fuse at point E. Dangerous timber and tree overhang along section D necessitated installing a sectionalizing point.

The sectionalizer at point C is set to open immediately after the first operation of the recloser at point G. A fault in line D is cleared by this sectionalizer-recloser combination with only a momentary interruption of service to other parts of the circuit controlled by the recloser. Thus an additional sectionalizing point is gained. Blowing of a transformer fuse along the spur conceivably can cause the one-count sectionalizer to open, but the inconvenience is small when the spur has only one or two transformers.

Although sectionalizers normally are not applied on the line side of the recloser, it can be done and is economically desirable under certain conditions. New York State Electric & Gas used this arrangement recently when a long branch line controlled by a recloser set for two fast and two slow operations was transferred from one feeder to another. The new feeder, equipped with a three-count oil sectionalizer, was one of three emanating from a common oil circuit breaker. The utility replaced the standard operation recloser with a one-fast, one-slow operating recloser in the branch line instead of devising a separately controlled feeder at the substation.

Large Reclosers Meet Suburban Needs . . . Large reclosers at points J and K in Fig 5 give the equivalent of two-shot fuse operation at the 12-spur line fuse sectionalizing points on a newly coordinated feeder in a suburban area. These reclosers also protect the two branch-line feeders without adversely affecting the operation of the three-count oil sectionalizers at the principal junction point between them and the substation. Such an installation requires particular caution in planning, as an overlooked instantaneous trip and instantaneous reclosing attachment on a feeder oil circuit breaker relay at the substation could add an extra short-circuit pulse of current that would cause a false operation of the sectionalizer.

Save up to 85%

brush handling costs

M & M Brush Grinder rapidly converts brush to chips and reduces piling, trucking, and burning costs.

Cut labor and truck operating costs as much as 85%. M & M Brush Grinder chews brush and branches up to 6" in diameter into small chips and automatically blows them over the ground or into a truck. Compact, portable unit with its own power plant. Haul it right to the job by jeep, or truck. Fully enclosed mechanism is protected from dust and dirt and completely safe. Sturdy construction for long, satisfactory service. Write today for illustrated folder.

MITTS & MERRILL 1002 South Water St. • Saginaw, Michigan

85

FIBERGLAS

HOT STICKS

These tools readily available in TUBULAR FIBERGLAS:

- Dieck Wire Tongs
- Dieck Tie Sticks
- Dieck Cutters
- Dieck Universal Poles
- Dieck Hook Sticks
- Dieck Fuse Pullers
- Dieck Clamp Sticks
- Dieck Grounding Sets

LIGHTER WEIGHT
DURABLE

DEPENDABLE STRENGTH
DEPENDABLE DIELECTRIC

DIECK TOOLS

Send for technical report "Fiberglas Hot Sticks" and price sheet. Sample piece of Fiberglas Hot Stick available on request.

BODENDIECK TOOL CO.
TAYLORVILLE, ILLINOIS

IT'S NEW!

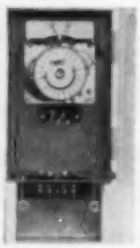
Pole Topper

A new mastic compound containing penta, formulated by the Osmose Laboratories to PROTECT THE ROOF of standing poles.

Write For Complete Details

OSMOSE
WOOD PRESERVING CO., OF AMERICA, INC.
980 Ellicott St. Buffalo 9, New York

SAUTER
TIME SWITCHES



Your Assurance
Of Unfailing Automatic Operation For On-Off Systems In All Public Utility, Industrial Farming and Domestic Applications.

The World Standard
SAUTER TIME SWITCHES are preferred for precision, perfect automatic operation, lower maintenance costs, and performance perfection even under the most adverse weather conditions.

Available either with synchroneous or escapement Swiss precision clock-movement, hand-set or astronomical dials.

Write for Complete Catalog

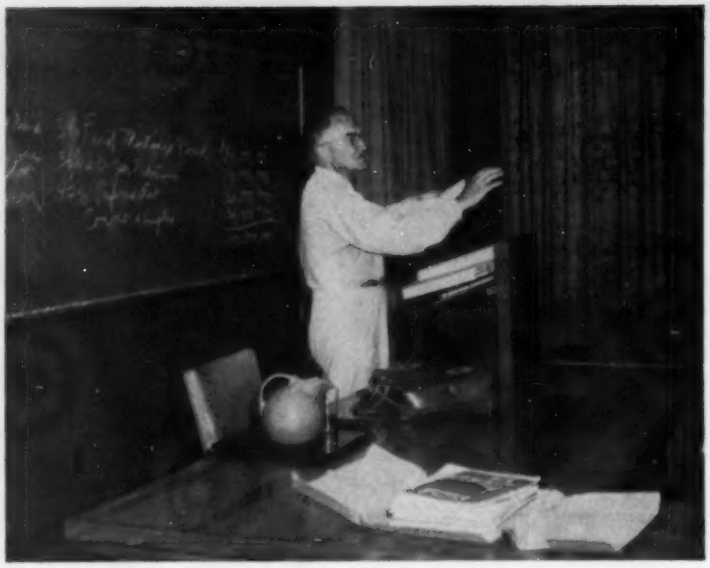
There is a Sauter Time Switch for Every Use

"More Reliable than the Personal Touch"

Paul Reinhart co., inc.
70 Beaver St., New York, N. Y.

Exclusive Representative for Sauter Switches

Protected Territories Available



Georgia Tech Readies Utility Course

The third annual Public Utility Executive Course will be held at the Georgia Institute of Technology, Atlanta, Ga., Aug. 1-27. The course is open to junior and top executives of power and associated companies throughout the country, and is sponsored by the Southeastern Electric Exchange. Prof A. J. G. Priest of the University of Virginia Law School, shown here addressing a previous class, will be one of many distinguished faculty members drawn from various leading universities. The faculty will be supplemented by guest speakers from the industry.

Fields of study included in the course are intended to offer an integrated presentation of the areas pertinent to executive development with a balance between theoretical and applied principles. Courses include general management, economics, personal development, public utility regulation, finance, accounting, marketing, public relations, personnel administration, and industrial relations.

For further information regarding the course, write J. W. Talley, managing director, Southeastern Electric Exchange, 303 Haas-Howell Bldg., Atlanta, Ga. Enrollment closes March 31.

Suit Against Colorado PS Is Dismissed by Court

Public Service Co of Colorado won dismissal of an injunction suit by Union Rural Electric Association of Brighton, Colo., seeking to block the private utility's service to a 6,000-home residential development on Denver's northern fringe.

District Judge Christian D. Stoner in Brighton court has granted two motions by Public Service to dismiss the action. The motions contended the court lacked jurisdiction over the subject matter and that the Union REA "failed to exhaust its administrative remedies."

Judge Stoner said at the conclusion of a three-hour hearing that the matter was an issue for consideration by the Colorado Public Utilities Commission. The judge said he would deny any motion for a rehearing before his court. The Union REA officials said they were considering taking the issue to the PUC.

Union REA, in a complaint filed in the Brighton court last November, contended that Public Service plans to serve the housing project constituted an "invasion" of co-op territory. The suit alleged it was a violation of a long-standing agreement over the areas the co-op and Public Service would serve.

W. W. Howell, assistant treasurer for Public Service, filed an answer in

court declaring "no agreement" exists. The utility also contended that—as a public utility—it has the "obligation, duty and right" to provide service to the project.

FTC Won't Take Part in Fair Trade Dispute

Federal Trade Commission has bluntly refused to join in the raging fight between retailers who honor fair trade prices and discount houses that sell at or near wholesale prices. In effect, FTC dumped issue back in laps of retailers and manufacturers.

FTC spelled out its policy in a letter made public Feb. 21 rejecting a request made by the American National Retail Jewelers Association that FPC investigate enforcement practices of jewelry manufacturers.

The retailers argued that many manufacturers force retailers to hold to fair trade prices, but allow discount houses to get away with undercutting those prices. This, said the retailers, amounts to an unfair method of competition in violation of the FTC Act.

But FTC won't buy the argument. It said it has no authority in the first place to enforce or regulate fair trade contracts. And it will not use antitrust sanctions to do so, at least until retailers can show they have exhausted all measures of "self-help." FTC, at least, thinks such measures will bear fruit. The letter points out that under state court decisions, retailers may either sue to stop price cutting by discount houses or—if manufacturers actually are negligent in enforcement—ignore the manufacturer's resale fixed price and cut it to meet the competition of the discount house.

Contract for Sub Reactors

The Navy has awarded a $12,417,488 contract to Westinghouse Electric Corp to design and build two new nuclear submarine reactors. The company is also responsible for developing plans for control equipment necessary to operate the reactors. The reactors will be built at Atomic Energy Commission's Bettis plant near Pittsburgh. Submarines themselves will be built at Portsmouth, N. H., naval shipyard and Electric Boat Division of General Dynamics Corp at Groton, Conn.

GENUINE — SIMPLE

SILVER PLATING

"ON THE JOB" WITH POWDER

Purposes of silver plating need not be explained to you of the electrical field.

The biggest problems of silver plating are its convenience, economy and thoroughness. "Cool-Amp" silver plating POWDER is the answer to these problems.

"Cool-Amp" deposits a genuine coat of silver that will not peel off and provides cool maximum conductivity for copper, brass or bronze contacts. It has been proven equal to any electroplating for bolted and stationary contacts and is far more adaptable . . . always ready to use.

"Cool-Amp" POWDER offers a quick and easy solution to heating due to oxidation, improves the continuity of electrical service and reduces maintenance.

"Cool-Amp" is completely harmless to the user and is simple to apply. It can be used by any number of people at the same time, ON THE JOB, in underground vaults and substations and in hard-to-get-at places. The only equipment needed is a sharp steel wire brush or abrasive cloth, clean rag and water.

Dampen a rag, dip in "Cool-Amp" and rub on surface. One pound will silver plate approximately 6,000 square inches.

$13.50 PER POUND — SHIPPED PREPAID

WRITE FOR FREE SAMPLE AND QUANTITY QUOTATIONS

GENUINE • SIMPLE SILVER PLATING

The COOL-AMP Co.

Dept. EW, 8603 S. W. 17th Avenue • Portland 19, Oregon

STEEL SPECIALISTS —
FOR THE ELECTRICAL INDUSTRY

Let us help you with your needs for galvanized structural steel. We specialize in *your* requirements; consultation, scheduling, detailing, fabrication and erection. Eighteen years of specialization in the fabrication of *transmission towers* and *substations* serve as proof of our ability to satisfy your needs. Try us!

FLINT STEEL

FLINT STEEL CORPORATION

TULSA • MEMPHIS

Eliminate
GUY GUARD TROUBLES
this easy
Flexibal
way

1 SLIP OVER WIRE
2 DRIVE HOME NAIL
3 ATTACH CLAMP
"the Economical Guard that can't go wrong"

R.E.A. APPROVED
COSTS 1/3 LESS THAN METAL GUARDS AND
NO MAINTENANCE PROBLEM

FLEXIBAL Guy Guards provide the flexibility that yields with the blow and cushions the impact. Aluminum-painted, they increase the day and night visibility. Easiest guard to handle, simplest and quickest to install—by all odds safest in use, with a proven record of greatly reduced losses. Specify it for better appearance, greater convenience, and major savings.

Used and Praised by Constantly Growing List of Utilities

Write for Free Sample and Prices

IMMEDIATE DELIVERY

TEN COMPLETE SETS IN THIS ONE LIGHT EASY TO HANDLE CARTON

SEE YOUR JOBBER OR WRITE TO
S. E. OVERTON COMPANY
SOUTH HAVEN, MICHIGAN

End of Federal Control On Natural Gas Urged

Large fuel-consuming industries will be affected if two strong recommendations made last week by President Eisenhower's Cabinet Fuels Policy Committee are put into effect. The proposals were:

1. That natural gas production be freed from federal control, provided that the Federal Power Commission would have the authority to determine whether any new rates paid by the pipeline companies represented a fair market price arrived at competitively. Currently, federal jurisdiction extends to well-head under Supreme Court decision in Phillips Petroleum case.

2. That crude oil and residual fuel oil imports be kept at the 1954 ratio to domestic supply.

The clear-cut policy statement was expected to add impetus to a drive in Congress for legislation to amend the Natural Gas Act to specify that the federal government should not tell the producer how much he shall charge for his gas. The battle will still be close, however, and the outcome is uncertain.

The general view is that if producer rates are freed, there likely will be an upswing in gas prices for a time. The higher prices, though, would stimulate more production and, in the long run, probably push prices back down again.

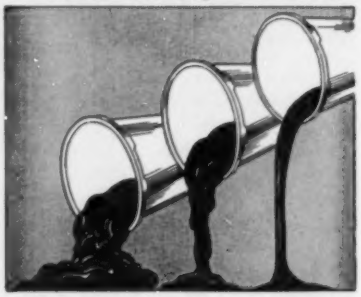
As for oil imports, if the importing companies meet the Cabinet Committee's request it probably would forestall any reduction in residual fuel oil prices in the U. S. Instead, if overall demands continue to rise as predicted, it could mean higher prices because imports could not rise enough to meet that increasing demand.

Summer Water Outlook on Columbia Called 'Poor'

Below average precipitation the past fall and winter and low snow accumulation on the vast Columbia basin watershed mountain ranges mean a "poor outlook" for water supply in the coming summer runoff season.

This was the forecast released jointly by the U. S. Weather Bureau and Soil Conservation Service in mid-February. Complicating the situation were very dry soil conditions expected to absorb considerable snow runoff. Reservoir storage on the major northern rivers

Insulating and Cable-Pulling
COMPOUNDS
of Record-Breaking Performance

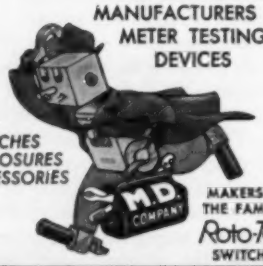


Mineralloc gives you a complete assortment for every need: dense, viscous and fluid consistencies for high and low voltages in cable-joints, pot-heads, terminal bells, distribution cables, street lighting, telephone work. . . . Insoluble in oil or water, for all temperatures. Clean, safe, economical—outranks all others in quality.

Send for new literature and prices.

MINERALLAC ELECTRIC COMPANY
25 North Peoria Street—Chicago 7, Illinois
MINERALLAC

LARGEST EXCLUSIVE MANUFACTURERS OF METER TESTING DEVICES



SWITCHES
ENCLOSURES
ACCESSORIES

MAKERS OF THE FAMOUS Roto-Test SWITCHES

METER DEVICES COMPANY • CANTON, OHIO

BUY
all the U. S. Saving Bonds
you can
and
KEEP
all the U. S. Saving Bonds
you buy

of the basin was rated good, but along the southern basin areas in Idaho and eastern Oregon the reservoirs are very low. For a normal water supply, very heavy and unseasonal snowfall and rains would be required throughout the basin during the remainder of the season.

The Columbia flow at The Dalles, Ore., is forecast at about 72% of the ten-year average (1943-1952); for the Snake River at Clarkston, Wash., 59%; and for the Columbia at Grand Coulee, Wash., 81%.

Central and eastern Oregon will experience the most critically short supplies. In this state, the snow accumulation is slightly over half the normal at mid-February. Precipitation over the state in January was half of the usual and failed to report normal at any station. The fall months of 1954 had about half normal precipitation. Water stored in 21 major reservoirs in Oregon is 40% less than a year ago and 85% of average for the past ten years.

26 Electric Utilities Get Good Management Awards

Twenty-six electric utilities have been awarded Certificates of Management Excellence for 1954 in the sixth annual management survey by the American Institute of Management. The utility companies are:

Boston Edison Co, Cleveland Electric Illuminating Co, Consolidated Gas Electric Light & Power Co of Baltimore, Detroit Edison Co, Montana Power Co, Pacific Gas & Electric Co, Pennsylvania Power & Light Co, Toledo Edison Co.

Union Electric Co of Missouri, Cincinnati Gas & Electric Co, Commonwealth Edison Co, Consumers Power Co, Iowa-Illinois Gas & Electric Co, Kansas Power & Light Co, Monongahela Power Co, Niagara Mohawk Power Corp, Virginia Electric & Power Co.

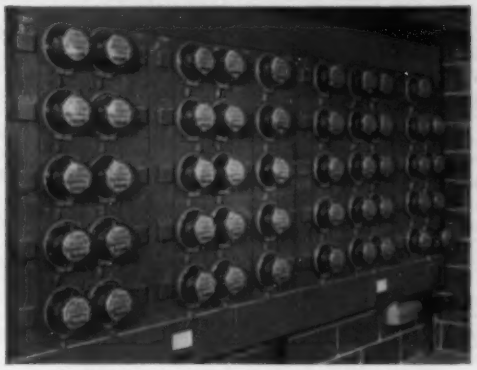
Atlantic City Electric Co, Columbus & Southern Ohio Electric Co, Georgia Power Co, Hartford Electric Light Co, Idaho Power Co, Ohio Edison Co, Pacific Power & Light Co, Southern California Edison Co, and Tampa Electric Co.

AIM is a non-profit foundation established for research and improvement of management profession.

TRADE MARK

ANCHOR

Meter Equipment Makes A Shipshape Job



Electrical Contractors—Anderson-Coffey Co., Boston

Typical apartment house Anchor Meter Channel combining 50 meter sockets and 50 loadside Breakers, with service wiring gutters top and bottom. Overall dimensions: Length 125", Height 64"

Anchor Meter Channels are Compact and Economical

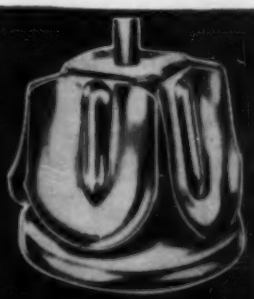
FULL INFORMATION ON REQUEST

ANCHOR MANUFACTURING CO., Manchester, N. H.

SPECIFY

Grip-Tite

EXPANDING ANCHORS



GRIP-TITE MANUFACTURING CO.

WINTERSET, IOWA

"Pioneers in the Anchor Field"

IN CANADA: LINE AND CABLE ACCESSORIES, LTD. • TORONTO

STEEL in stock

CERTIFIED QUALITY... QUICK DELIVERY

PRODUCTS: Carbon, Alloy & Stainless Steel Bars, Structurals, Plates, Sheets, Tubing Reinforcing, Babbitt, Machinery & Tools, etc.

RYERSON

JOSEPH T. RYERSON & SON, INC., PLANTS: NEW YORK • PHILADELPHIA • CHARLOTTE, N. C. BOSTON • CINCINNATI • CLEVELAND • DETROIT • PITTSBURGH • BUFFALO • CHICAGO MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

PROFESSIONAL SERVICES

BARKER & WHEELER

Utility and Industrial Valuations, Design and Construction of Power Systems, Water Supplies, Sewerage and Sewage Disposal, Factory Production and Cost Control Systems.

11 Park Place, New York City
36 State Street, Albany, N. Y.

HOOSIER ENGINEERING COMPANY

Erecting Engineers

Transmission Lines, Substations

1384 Holly Avenue, Columbus, Ohio

CHAS. T. MAIN, INC.

Engineers

Electric, Steam and Hydraulic Projects, Investigations, Reports, Designs and Appraisals

Chamber of Commerce Building
80 Federal St., Boston 10, Mass.

BLACK & VEATCH

Consulting Engineers

Electricity—Water—Sewage—Industry

Reports, Design, Supervision of Construction, Investigations, Valuations and Rates

4706 Broadway — Kansas City 2, Missouri

S. E. HUEY & CO.

Engineers & Surveyors

SURVEYS FOR ENGINEERS

Monroe — Louisiana

PIONEER SERVICE & ENGINEERING CO.

Consulting and Design Engineers . . Purchasing . . Specialists in Financing Accounting and Other Operations

231 So. La Salle St. — Chicago 4

THEODORE D. BROSS & COMPANY

Steel Tower & Wood Transmission Lines

Distribution & Maintenance

175 Enfield St. — Hartford, Conn.

JACKSON & MORELAND

Engineers and Consultants

Design and Supervision of Construction

Reports—Examinations—Appraisals

Machine Design—Technical Publications

Boston — New York

Recording & Statistical Corp.

BILL ANALYSIS—CONSUMPTION STUDIES

THE ONE-STEP METHOD
(exclusive with R&S)

100 Sixth Ave. WOrth 6-2700 New York 13, N. Y.

DAY & ZIMMERMAN, INC.

Engineers

Design - Construction - Management
Investigations and Reports

New York — Philadelphia — Chicago

M. W. KELLOGG

Piping System Design Analyses

Unique piping system model tester as well as modern IBM card programming computer available for low cost, accurate analyses of the most complex piping systems.

The M. W. Kellogg Company,
225 Broadway, New York 7, N. Y.

REIS & CHANDLER, INC.

ADVISORS TO UTILITIES

Financing—Rate of Return

30 Vesey Street, — New York 7, N. Y.

Doble Engineering Company

Electrical Insulation Engineers

Field Testing and Maintenance of High Tension Insulation, Special Problems in Electrical Communications

Office and Laboratory: Doble Park
Box 344, Belmont 78, Mass. (6 miles from Boston)
Branch Office: 30 N. Wacker Dr., Chicago, Ill.

THE KULJIAN CORPORATION

Engineers - Constructors - Consultants

POWER PLANT SPECIALISTS
(Steam, Hydro, Diesel)

Utility • Industrial • Chemical

1200 N. Broad St., — Philadelphia 21, Pa.

SANDERSON & PORTER

Engineers and Constructors Reports and Surveys

New York — New York

ELECTRICAL TESTING LABORATORIES, INC.

Electrical, mechanical, photometric, radiometric and chemical laboratories, rendering testing, research and associated services, including certification, inspections at factories and field investigations.

2 East End Avenue at 79th St., New York 21, N. Y.

PETER F. LOFTUS CORPORATION

Design and Consulting Engineers

Electrical • Mechanical • Structural
Civil • Thermodynamic • Architectural

First National Bank Building
Pittsburgh 22, Pennsylvania

SARGENT & LUNDY

ENGINEERS

140 South Dearborn St.

Chicago, Ill.

ROBERT E. FOLEY CONSTRUCTION CORPORATION

Construction & Maintenance

Transmission—Distribution—Communication Lines
Substation, Radio and Television Towers

48 Griswold St. — Binghamton, N. Y.

N. A. LOUGEE & COMPANY

Engineers and Consultants

REPORTS — APPRAISALS
DEPRECIATION STUDIES—RATE CASES
BUSINESS AND ECONOMIC STUDIES

120 Broadway — New York

F. W. SCHEIDENHELM

Consulting Engineer

Hydraulic Engineering, Hydro-electric Development, Water Supply, Flood Control, Engineering Problems relating to Water Rights and Water Power Law. Appraisals

50 Church Street, — New York 7, N. Y.

FORD, BACON & DAVIS

Engineers

DESIGN • CONSTRUCTION
VALUATIONS • REPORTS

New York • Chicago • Los Angeles

LUCAS & LUICK

Engineers

DESIGN, CONSTRUCTION, SUPERVISION, OPERATION, MANAGEMENT, APPRAISALS, INVESTIGATIONS, REPORTS, RATES

231 S. LaSalle St., Chicago

F. A. TUCKER, INC.

Contractors—Engineers

specialize in

Distribution - Transmission - Telephone lines - Maintenance - Roads - Bridges Dams

Main Office — 88½ Center Street, Rutland, Vt.
Branch Office—4612 Wilkinson Blvd., Charlotte, N. C.

GILBERT ASSOCIATES, Inc.

Engineers • Consultants • Constructors
Reading, Pa.

Engineering and Design • Construction Supervision
Industrial • Sanitary • Safety
Chemical Laboratory Services
Business and Economic Research
Industrial Relations • Purchasing

New York — Philadelphia — Washington
Rome — Manila — Medellin

THE LUMMUS COMPANY

Engineers and Constructors

385 Madison Ave., New York, N. Y.

Chicago . . Houston . . London
Paris . . The Hague . . Montreal
Caracas . . Bombay

UTILITIES LINE CONSTRUCTION COMPANY, INC.

Construction and Maintenance

Transmission - Distribution
Electric and Telephone Lines
Consultants

505 York Road — Jenkintown, Pa.

HARZA ENGINEERING CO.

Consulting Engineers

Calvin V. Davis — E. Montford Funk
Richard D. Harza

Hydroelectric Plants and Dams
Transmission Lines
Flood Control, Irrigation
River Basin Development

400 West Madison Street — Chicago 6

LUTZ & MAY

Consulting Engineers

STEAM, GAS & DIESEL POWER STATIONS
PUMPING PLANTS — ELECTRIC SYSTEMS
REPORTS — DESIGN — APPRAISALS

1008 Baltimore — Kansas City 6, Mo.

THE J. G. WHITE ENGINEERING CORPORATION

Design • Construction • Reports • Appraisals

80 Broad Street, New York 4

Advertising In This Issue

Allis-Chalmers Mfg. Co....4th Cover
19, 20, 21, 22, 36, 37, 124, 125, 158
American Creosoting Co.....50, 51
Anaconda Wire & Cable Co..... 67
Anchor Mfg. Co..... 189

Bakelite Co., Div. Union Carbide & Carbon Corp..... 206
Baltimore & Ohio Railroad..... 24
Bell Telephone Laboratories.... 197
Bethlehem Steel Co..... 167
Bodendieck Tool Co..... 185
Brewer-Titchener Corp..... 35
Bristol Co., The..... 61

Chance Co., A. B.....60, 133
Cochrane Corp. 9
Cool-Amp Co. 187
Cornell-Dubilier Electric Corp. 154, 155
Cyclone Fence Dept. United States Steel Corp..... 171

Delco-Remy Div., General Motors Corp. 48, 49
Delta-Star Electric Div., H. K. Porter Co., Inc..... 113
Directory of Engineers..... 190
Dodge Div., Chrysler Corp..... 38
du Pont de Nemours & Co., (Inc.) E. I. Grasselli Chemicals Dept. 42

Electric Machinery Mfg. Co.... 175
Electric Storage Battery Co. 3rd Cover
Electrical Facilities, Inc..... 166
Electro Switch Corp..... 164
Elliott Co. 153
Engineers Directory of..... 190
Erico Products, Inc..... 33
Everstick Anchor Co..... 138

Flint Steel Corp..... 187

G&W Electric Specialty Co..... 127
Gar Wood Industries, Inc..... 174
General Electric Co.
Apparatus Dept. 104, 105, 107 108, 109, 110, 111
Electronics Dept. 34
General Radio Co..... 14
Globe Co., The..... 173
Graybar Electric Co..... 5
Grinnell Co., Inc..... 7
Grip-Tite Mfg. Co..... 189

Hazard Insulated Wire Works.4, 116
Holan Corp., J. H..... 46
Homelite Corp 181
Hubbard & Co..... 137

I-T-E Circuit Breaker Co., R&IE Equipment Div..... 43
Indiana Steel & Wire Co..... 176
International Harvester Co..... 165

Johns-Manville 47

KPF Electric Co..... 157
Kearney Corp., James R..... 66
Kees Mfg. Co., F. D..... 184
Kennecott Copper Corp.....178, 179
Kerite Co., The..... 70
Koppers Co., Inc..... 156
Kuhlman Electric Co.....64, 65

Lapp Insulator Co., Inc.....10, 11
Leeds & Northrup Co..... 203
Line Material Co..25, 26, 27, 28, 29
Locke Dept. General Electric Co. 44, 45

Malleable Iron Fittings Co..... 16
Meter Devices Co..... 188
Minerallac Electric Co..... 188
Minneapolis-Honeywell Regulator Co., Industrial Div....168, 169
Mitts & Merrill..... 185
Moloney Electric Co.....114, 115
Monsanto Chemical Co..... 6

National Telephone Supply Co., The 8
Natvar Corp. 55

Ohio Brass Co....119, 120, 121, 122
Okonite Co., The.....4, 116
Orangeburg Mfg. Co., Inc..... 32
Osmose Wood Preserving Co. of America, Inc. 186
Overton Co., S. E..... 188

Page Steel & Wire Div. American Chain & Cable..... 151
Pennsylvania Transformer Co.. 129
Petersen Engineering Co..... 63
Phelps Dodge Copper Products Corp. 56, 57
Porcelain Insulator Corp...134, 135
Preformed Line Products Co.... 53

Reinhart Co., Inc..... 186
Remington Rand, Inc..... 23
Republic Steel, Steel & Tubes Div. 18
Reynolds Metals Co..... 62
Richardson-Allen Corp. 170
Rockbestos Products Corp..... 201
Roller-Smith Corp. 17
Royal Electric Mfg. Co..... 160
Ryerson & Son, Inc., Joseph T.. 189

Sangamo Electric Co.....30, 31
Searchlight Section 192, 193
Shell Oil Co..... 54
Simplex Wire & Cable Co..... 131
Smith Co., S. Morgan..... 52
Socony-Vacuum Oil Co., Inc.... 15
Southern States Equipment Corp. 59
Square D Co..... 39
Standard Transformer Co., The 68, 69
Stull's Chemicals 176
Subox, Inc. 152

Texas Co., The.....2nd Cover
Thomas & Betts Co., The..... 58
Thompson Chemicals Corp..... 162
Triangle Conduit & Cable Co., Inc. 161

Union Carbide & Carbon Corp., Bakelite Div. 206
United States Rubber Co....40, 41

Wagner Electric Corp.....12, 13
Western Precipitation Corp.... 177
Westinghouse Electric Corp.... 139
140, 141, 142, 143, 144, 145, 146
147, 148, 149, 150, 163, 199

PROFESSIONAL SERVICES 190

SEARCHLIGHT SECTION

(Classified Advertising)

H. E. Hilty, Mgr.

EMPLOYMENT
Positions Vacant 192
Selling Opportunities Offered..... 192
Positions Wanted 192
Employment Services 192

EQUIPMENT
(Used or Surplus New)
For Sale 193

CLASSIFIED SEARCHLIGHT SECTION ADVERTISING

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

UNDISPLAYED RATE:

$1.50 a line, minimum 3 lines.
To figure advance payment count 5 average words as a line.

INDIVIDUAL EMPLOYMENT WANTED undisplayed advertising rate is one-half of above rate, payable in advance.

PROPOSALS, $1.50 a line an insertion.

INFORMATION:

BOX NUMBERS count as 1 line additional in undisplayed ads.

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals.)

EQUIPMENT WANTED OR FOR SALE Advertisements acceptable only in Displayed Style.

DISPLAYED RATE:

The advertising rate is $14.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches —to a page. E. W.

SEND NEW ADVERTISEMENTS TO: 330 W. 42 ST., N. Y. 36, N. Y. for March 21st issue closing March 11th

ELECTRICAL ENGINEERS

Foreign Employment

Graduate engineers with minimum 5 years' experience in operation, design, maintenance or construction of power generation, transmission and dispatching; radio & VHF communications or heavy industrial facilities.

For specialized assignments commensurate with qualifications in a large scale foreign operation embodying oil producing, refining, together with all supporting facilities including all utilities.

Write giving full particulars regarding personal history and work experience. Please include telephone number.

Recruiting Supervisor, Box 9

ARABIAN AMERICAN OIL COMPANY
505 Park Avenue
New York 22, New York

Foreign Service
RELAY TECHNICIANS

Qualified Journeyman Electrician with minimum 2 years' experience as a Relay Technician investigating and correcting power line circuit troubles caused by relay failures.

Write giving full particulars regarding personal history and work experience. Please include telephone number.

Recruiting Supervisor, Box 101
ARABIAN AMERICAN OIL COMPANY
505 Park Avenue New York 22, N. Y.

WANTED
DISTRIBUTION ENGINEER

To head up this activity on a system basis with a rapidly growing medium-size midwest utility company. Must be a graduate engineer with considerable experience in distribution, planning and construction. Send resume of experience and qualifications to

P-5045, Electrical World
330 West 42nd Street, New York 36, New York

ELECTRICAL ENGINEER

Leading food manufacturer located in Southern Michigan has an opening in Company Engineering Department for a qualified graduate Electrical Engineer with three to five years experience who is looking for an opportunity where his initial training and experience plus performance will lead to greater responsibilities.

Duties include lay-out and specifications of factory power system sub-stations, motor control centers, conduit systems and wiring diagrams.

Proven work methods, ability to work with others and strong leadership qualities are valuable assets for this position and future advancement.

Salary based on experience and ability.

Send complete resume to

P-5636, Electrical World
520 N. Michigan Ave., Chicago 11, Ill.

WIRE AND CABLE ENGINEER

Excellent opening for a man with extensive manufacturing experience in rubber covered wire and cable. This is a foreign assignment with large, reputable American firm. Prefer a man with a technical education. Good opportunity for future. Please submit complete resume of education, experience, and salary requirements.

P-5719, Electrical World
330 W. 42 St., New York 36, N. Y.

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)
LOS ANGELES: 1111 Wilshire Blvd. (17)

POSITIONS VACANT

DISTRIBUTION ENGINEERS — Competent graduate electrical engineers with at least 10 years experience design, operation and maintenance of distribution facilities required by rapidly growing utility desirable location South America. Portuguese or Spanish useful—not required to start. Reply stating age, education, experience, personal particulars and minimum salary expected. P-5738, Electrical World.

DISTRIBUTION ENGINEERS — Graduate Electrical Engineers — Senior — at least 10 years field experience with operating utility company. Junior 3 years experience. Permanent position long established consulting organization New York. Some travel Latin America necessary in future. Knowledge of Spanish or Portuguese useful. Salary commensurate with experience. Reply stating age, education, experience, personal particulars and minimum salary expected. P-5739, Electrical World.

ELECTRICAL ENGINEER—Graduate with at least 5 years experience protective relay work with electric utility company. Relay studies, system development studies and general technical electrical operating and design work. Permanent position long established consulting organization. Headquarters New York. Some travel Latin America. Knowledge of Spanish or Portuguese desirable—not essential. Salary commensurate with experience. Reply stating age, education, experience, personal particulars and minimum salary expected. P-5740, Electrical World.

WANTED

Unusual opportunity for salesman, experienced in calling on utilities to head up a well established North Atlantic states territory for eastern manufacturer of Pole line hardware specialties. Current earnings five figures. Expenses. Incumbent retiring because of exigencies beyond his control.

SW-5416, Electrical World
330 W. 42 St., New York 36, N. Y.

POSITION VACANT

GRADUATE ELECTRICAL Engineers — one senior—two juniors—senior at least 10 years experience—junior 3 to 5 years experience in electrical design, operation and construction of steam, hydro plants and substations. Permanent position with long established consulting organization for public utility operating companies located Latin America. Headquarters New York. Some travel necessary in future. Knowledge of Spanish or Portuguese useful—not essential. Salary commensurate with qualifications. Good opportunity. Reply stating age, education, experience and personal particulars. P-5741, Electrical World.

SELLING OPPORTUNITY OFFERED

INTERNATIONAL KNOWN time switch manufacturer. Excellent opportunity for individual or organization in exclusive territory. Should now be selling electrical equipment to utilities, municipalities, counties, contractors, etc. No competing lines. Commission. Send resume of organization, partial list of contacts now made and lines now representing. RW-5526, Electrical World.

EMPLOYMENT SERVICES

SALARIED PERSONNEL, $3,000-$25,000. This confidential service established 1920, is geared to needs of high grade men who seek a change of connection under conditions assuring, if employed, full protection to present position. Send name and address only for details. Personal consultation invited. Jira Thayer Jennings, Dept. L, 241 Orange St., New Haven, Conn.

POSITIONS WANTED

GRAD. ENG., 20 yrs. exp., Elect. Const., utility operation and const., and plant elect. maint. Want challenging work. Will relocate. PW-5395, Electrical World, 520 N. Michigan Avenue, Chicago 11, Illinois.

SALES PROMOTION Public Relations and advertising. 20 years experience with major utility boiler designers, seeks challenging similar position with a utility or power plant equipment manufacturer. Engineering background, age 45, now available. Will relocate. PW-5699, Electrical World.

FIELD ELECTRICAL engineer, 30 years experience, construction power houses, transmission lines, distribution systems. Will travel, domestic or foreign. Fluent in Latin languages. Available immediately. PW-5722, Electrical World.

GRADUATE ELECTRICAL engineer, 31 years of age with two years experience as resident engineer in REA work and five years as engineer for public utility in operations, maintenance and construction work. Will relocate. PW-5693, Electrical World, 520 N. Michigan Avenue, Chicago 11, Illinois.

SALES ENGINEER
PRODUCT MANAGER

Well established, growing electrical equipment manufacturer seeks E.E. or M.E. grad, age 28-40, with engineering and application sales work experience for position of Product Manager. Power company experience helpful. Should know transmission and distribution equipment and be able to work effectively with design engineering department, field salesmen, and customers. Will report to Sales Manager.

Good salary, annual bonus, merit increases, retirement plan, opportunity to advance with a solid, growing co. Pleasant living and working conditions, modern plant and offices, small midwest community, good schools. Confidential. Write details—age, education, experience to:

Joseph M. Arndt, Employment Manager

A. B. Chance Company
Centralia, Missouri

POSITION WANTED

ELECTRICAL ENGINEER, BSEE, age 30, married; 1 year G-E test, 7 years diversified experience in large mining company with responsible charge of construction, maintenance and operation of extensive facilities for generation, transmission and application of electricity and steam. Desires opportunity to utilize experience with progressive company. PW-5675, Electrical World.

PERIODICALS

A.I.E.E. transactions back-volumes wanted to buy for cash. Ashley 24 E, 21, N.Y.C. (10).

WANTED

ANYTHING within reason that is wanted in the field served by Electrical World can be quickly located through bringing it to the attention of thousands of men whose interest is assured because this is the business paper they read.

8100 KVA
Diesel Power Plant

For sale Complete or as Individual Units. New 1943. Can be inspected operating.

3—Busch-Sulzer Diesel Engines, 3060 HP, 9 cyls., 2 cycle, 240 RPM, Type 9 DHB-27½, direct coupled to:

3—2700 KVA Electric Machinery Alternators, .8 PF, 2160 KW, 3/60/2300/4160 volts, with 30 KW, 125 volt, V-belted Exciters. Complete with all auxiliaries.

HEAT & POWER CO., INC.
70 Pine St. New York 5, N. Y.
HANOVER 2-4890

ELECTRICAL WIRE AND CABLE

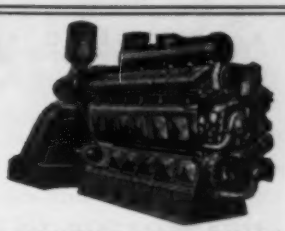
—Your Best Source—
- for every industrial and power application
- Odd lengths—long and short—reasonably priced

One of the Largest Stocks in Midwest
Let us quote on requirements—
send your inquiries
We'll also buy Surplus
Branch Offices:
Houston— Yukon 5547
Los Angeles— ANgelus 3-5148

UNIVERSAL Wire and Cable Co.
2642 N. Clybern Ave., Chicago 14, Ill.
EAstgate 7-4777 Code: UNIWIRE

DIESEL POWER

IMMEDIATE SHIPMENT
• PURCHASE OR RENTAL
UNIT CAPACITIES—10 TO 2475 KVA
A.C.—50 AND 60 CYCLES
• ALSO D.C. UNITS



A PARTIAL LISTING OF OUR INVENTORY

KW	Make	Model	HP	RPM	KW	Make	Model	HP	RPM
1180	Worthington	SEH-8	1685	360	320	Superior	60E-6	460	450
1136	Fairbanks Morse	38D	1600	720	300	Fairbanks Morse	32E14	450	300
1100	General Motors	16-278A	1600	720	300	General Motors	8-268A	450	1200
1000	General Motors	16-567B	1440	720	250	Clark	ED-4	375	300
750	General Motors	12-567	1080	720	200	General Motors	8-268A	350	900
700	Worthington	EE-6	1000	327	175	General Motors	12-71	275	1800
675	Fairbanks Morse	38D	980	720	180	Buckeye	80	240	600
500	General Motors	8-567	720	720	148	Fairbanks Morse	32E14	220	300
500	Alco	6-12½x13T	730	600	100	General Motors	3-268A	150	1200
350	Baldwin	VO-6	510	450	60	General Motors	6-71	90	1200
320	Enterprise	DSG-6	460	450					

A. G. SCHOONMAKER COMPANY, INC.
DIESEL DIVISION, 50 CHURCH ST., NEW YORK 7, N. Y.

TRANSFORMERS

FOR SALE

3—1000 KVA Moloney 13200-2300/4000Y
3— 833 KVA G-E 35000—480
3— 500 KVA G-E 26400—240/480
5— 333 KVA W-H 38000-7200/12470Y
3— 333 KVA G-E 33000-2300/4000Y/8900/-11850Y
3— 333 KVA G-E 33000-2300/4000Y
3— 333 KVA Mol 7200/12470Y-2300/4160Y
3— 150 KVA G-E 19050/33000Y-2540/4000Y
5— 150 KVA G-E 7200/12470Y-240/480
3— 100 KVA G-E 33000-4800/11850Y

Many other items in stock.

TRANSFORMERS WANTED

Reliable rewind and repair service on all makes of transformers

THE ELECTRIC SERVICE CO.
Cincinnati 27, Ohio
40 Years Dependable Service

MOTORS • GENERATORS
TRANSFORMERS
NEW • REBUILT
WORLD'S LARGEST INVENTORY
ELECTRIC EQUIPMENT CO.
PHONE STATION COLLECT GL 6783
P.O. BOX 51 ROCHESTER 1, NEW YORK

SUBSTATION EQUIPMENT

TRANSFORMERS

QU.	KVA	MFR	VOLTAGE
1	5000	West.	115000—14400, 3 ph.
1	10000	A. C.	66000—33000, 3 ph.
1	3750	West.	69000—14400, 3 ph.
4	2500	Mol.	66000—13800
1	800	Kuhl.	66000—480
4	500	West.	69000—6900
3	400	G. E.	66000/33000—2300/4160
3	333	Stand.	69000/34500—7200/12470 Y
3	200	Pitts.	66000—2300
3	1500	West.	44000—6900
3	1250	A. C.	44000/11500—460
4	150	West.	44000/33000—2300 6900
3	75	Est.	44000—7200/12470 Y
3	5000	G. E.	38100/66000—6600
1	3750	Penna.	38030/65865 Y—13800 3 ph
4	3333	G. E.	38100/66000 Y—33000
4	3125	Mol.	39900/66000 Y—26600/46000 Y
6	2000	Mol.	38100/66000 Y—13800
3	1333	G. E.	33000/11000—2400 7200
4	333	G. E.	34500—13800/23900 Y
1	3000	G. E.	33000—6900/2300, 3 h.
2	3000	Stand.	33000—4160, 3 ph.
3	200	A. C.	34500—2400/7200/12470 Y
3	75	Way.	33000—240/480
2	3750	G. E.	26400—4800/8320, 3 ph
3	1250	G. E.	264/13200—2400
4	1500	A. C.	25400/44000 Y—6900/11950
4	833	G. E.	14400/24900 Y—2400/4160 Y
4	450	A. C.	25410/44000 Y—13200/23090
3	100	G. E.	22000—7200/12470 Y
3	667	A. C.	19051/33000 Y—2400/4160 Y
1	600	Stand.	13200—2300, 3 ph.
1	450	Penna.	13200—2400, 3 ph. ASKAREL
6	200	G. E.	13200—230/460
4	167	G. E.	7200/2470 Y—2400
3	125	A. C.	6900—2300
3	37½	G. E.	6900—230/460
4	150	G. E.	4800/2400—240/120
2	100	G. E.	4800/2400—240/480
1	1500	G. E.	4160—480, 3 ph.
3	333	G. E.	2400/4160 Y—460
3	250	G. E.	2300/4600 Y—115/230
3	200	West.	2400—240/480
1	150	West.	2400—230/115
1	100	G. E.	2300—575, 3 ph.

ALSO:—FREQUENCY CHANGERS
MOTOR GENERATOR SETS
SYN. CONDENSERS
OIL CIRCUIT BREAKERS
FEEDER REGULATORS, ETC.

BREW, WOLTMAN & CO., INC.
52 Church St. New York 7, N. Y.

MATERIAL HANDLING
FORK LIFTS

NEW—UNUSED GOV'T SURPLUS
Heavy Duty, 6-Wheel Pneumatic Tires

3,500 lb capacity, 144" lift height $2,250
6,000 lb capacity, 168" lift height $2,750
15,000 lb capacity, 210" lift height $3,750

Above lifts far below replacement cost.
Ideal for Yard Operations

TRIPLEX MOTOR PARTS
62 West St., Bklyn. 22, N. Y.
EVergreen 3-2600

Specialist for 47 Years in—

LARGE POWER EQUIPMENT

Do you receive our stock list? Prompt shipment from inventory. A.C. & D.C. Motors, Transformers, M-G Sets, Frequency Changers, Controls, Turbo-Generators and Circuit Breakers. Attractive prices for rebuilt-guaranteed equipment. Contact us before purchasing.

BELYEA COMPANY, INC.
51 Howell St. Jersey City 6, N. J.

FINANCIAL AID TO HIGHER EDUCATION

Our Colleges and Universities Are Living on Borrowed Time

. . . time borrowed from underpaid faculty members

The chart on this page tells a story of profound importance to every American. It is the story of the financial beating our college and university faculty members have been taking in the past 14 war and postwar years.

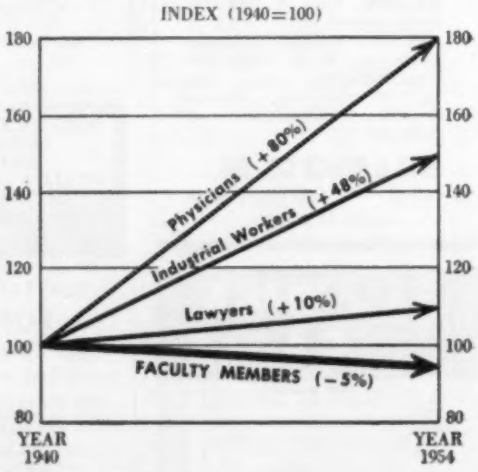
On the whole, this span of 14 years has been one of great and growing prosperity. But, as the chart shows, our college and university faculty members have, as a group, had less than no share in it.

During this period, from 1940 through 1954, the real income of the average industrial worker (that is, what his wages would purchase in goods and services) has increased by almost one-half. Among professional groups, physicians have enjoyed an increase of about 80 per cent in their real income. Lawyers, far less favored financially, have had an increase of about 10 per cent. But faculty members have not only had no increase at all; over these years of prosperity their average real income has fallen by 5 per cent. These figures do not take account of the increase in taxes since 1940.

Senior Teachers Hardest Hit

These figures are, of course, averages. For some groups of faculty members it has been better; for others worse. It has been particularly hard on senior faculty members. Between 1941 and 1953 their salaries lost about 8 per cent of their purchasing power. Being deeply committed to their careers they could not respond to alternative employment opportunities as readily as could their junior colleagues. For junior faculty members there was some increase in real income between 1941 and 1953 but only about half as much as the average for the nation.

What's Happened to College Faculty Salaries*



* Real Income before Taxes

Source: Council for Financial Aid to Education; U. S. Dep't of Commerce; U. S. Dep't of Labor.

Public Colleges Fare Better

There are also marked differences in the average financial reward received by faculty members in different types of colleges and universities. A recent study by the Council for Financial Aid to Education indicates that, in the last academic year, 1953-1954, teachers in privately endowed, independent colleges and universities were paid an average salary about $1000 less than that paid to faculty members in tax-supported institutions. The same study indicates that salaries far below the average are especially common for faculty members in the small private liberal arts colleges. This study found that during the last academic year the average salary of all college and university faculty members was about $4700.

The special difficulties under which the independent colleges and universities, and particularly the independent liberal arts colleges, are laboring to get back on their feet financially have been discussed in previous editorials in this series. These difficulties underline the need of special help for these institutions to which business firms are now contributing in increasing volume. However, the problem of providing better salaries is not peculiar to any particular type of institution.

Faculty Members Not Greedy

It is not easy to prescribe a precise standard of fair pay for college and university faculty members. This is partly because they put less weight relatively on money rewards than they put on rewards of scholarly accomplishment and prestige. Consequently, they have consistently been willing to work for very modest salaries in relation to the intellectual ability, education and application required. Obviously, however, it is the dictate both of fairness and good judgment to see that faculty members are given a roughly proportionate share in the general prosperity. Indeed, their crucial role in our society could be made to justify a larger share than this.

There is no way to know with any degree of precision what the underpayment of our college and university faculty members over the past 14 years has actually cost the nation in terms of reduced quality of intellectual performance of those institutions. One reason is that the damage has been minimized by the devoted services of many faculty members who have loyally stuck to their jobs in spite of the great financial discouragement.

It is obvious, however, that, if no grave deterioration in the intellectual performance of our colleges and universities has occurred so far, it is because we have been living on borrowed time. It is time borrowed from faculty members who have, in effect, been subsidizing these institutions by their financial sacrifice. This arrangement is not only a menace to the cultural and intellectual life of the nation, it is also a menace to our national security in a time when successful national survival may well depend in peculiar degree on the full development and utilization of our intellectual resources. We depend on our college and university faculties pre-eminently to provide this development. Adequate financial reward for such service is an elementary form of national insurance.

Many of our colleges and universities are working hard to improve the financial lot of their faculty members. Business firms are also playing an increasing role of providing the necessary financial assistance. The methods being used by business for this purpose will be the subject of another editorial in this series. However, **vastly more must be done, and quickly, to stop the financial beating being taken by our college and university faculty members if the nation's welfare and safety are to be properly protected.**

This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nationwide developments that are of particular concern to the business and professional community served by our industrial and technical publications.

Permission is freely extended to newspapers, groups or individuals to quote or reprint all or parts of the text.

Donald C. McGraw

PRESIDENT

McGRAW-HILL PUBLISHING COMPANY, INC.

Awards for Town Progress

Utility contests spur community improvement, bring industries. They are building community pride in N. C., S. C. and Missouri.

Two North Carolina, and one South Carolina towns are top winners in Carolina Power & Light Co's 1954 "Finer Carolina" contest for community development. Asheboro and Wallace, N. C. and Clio, S. C. won prizes of $1,000 each for a wide variety of town improvements ranging from school and playground beautification to construction of a new health center.

Leadwood, Mo, was first place winner in the adult phase of Union Electric Co's "Planned Progress Program." The award also was $1,000 to be used for further civic improvement. To win, the planned progress council of Leadwood had raised some $26,000 for landscaping and improving the city park and for purchasing equipment for the Leadwood Volunteer Fire Department.

The Carolina P&L contest is now going into its fifth year with more than 150 towns entered for the present year. The judging is conducted by university professors who study each town's accomplishments as recorded in scrapbooks submitted by the town.

Even the losers in the "Finer Carolina" contest benefit from the competitive spirit of community development. A typical comment from one town which failed to place in this year's contest: "We have been rewarded in a way in which we had not expected. This reward has been the resulting growth of our community in terms of community spirit, pride, homes and business."

Union Electric Co notes that "Planned Progress" towns have built new sidewalks, paved streets, built parks, improved schools, provided recreation centers, organized fire departments and accomplished dozens of other things, large and small, that needed doing.

Con Ed's Cat–9.2 Billion Pats

Pat a cat on a cold day and it makes electricity. An engineer of Consolidated Edison Co of New York one dull evening last month set out to find how much. Borrowing his daughter Alexandra's cat and finding an old electrostatic volt-meter, he measured some sample pats. Slide rule in hand, he figured that some 9.2 billion cat pats are required to light a 75-watt bulb for one minute.

Result: the story hit New York papers, brought inquiries from as far away as Salt Lake City. Con Ed's press information office hopes readers will remember the 75-watt bulb and Con Edison. It is not worried about the utility business going to the cats.

PUAA Ad Contest Draws Nearly 2,000 Entries

Judges in Public Utility Advertising Association's annual "Better Copy" contest have already tallied 1,906 entries in 21 classifications and two other classifications are still unreported.

Ernest R. Laws of Philadelphia Electric Co, Chairman of this year's contest, estimates that some 300 utility companies are participating in the 1955 contest. He reports a good distribution of entries among the various classes of utilities.

Laws reminds all utility advertising managers that the deadline for entries under the "annual report" classification is April 1.

Winners for all classifications will be announced at the annual PUAA convention in Chicago May 12-13.

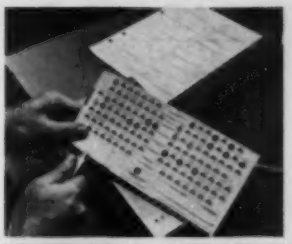
LILCO Adds CR Dept

Long Island Lighting Co has created a Community Relations Department to offer informative and educational programs to civic and business groups. William A. Miller, Jr., Assistant Vice-President, heads the new Department.

Subject matter of the programs is partly of a "get acquainted" nature. It covers such topics as details of LILCO's operation, "close-ups" of the company's plants, and a look at future plans. The new department also arranges field trips to LILCO's plants.

How your telephone call asks directions... and gets quick answers

1

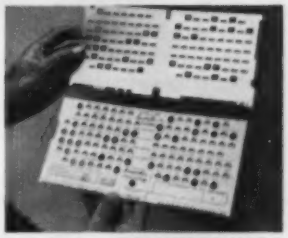


2

Perforated steel cards, which give directions to the Long Distance dial telephone system, are easy to keep up to date. New information is clipped (1) and punched (2) by hand on a cardboard template. This guides the punch-press that perforates a steel card (3), and the two are checked (4). The new card is put into service in the card translator (5).

↓3

4



5

When the Bell System's latest dial equipment receives orders to connect your telephone with another in a distant city, it must find—quickly and automatically—the best route.

Route information is supplied in code—as holes punched on steel cards. When a call comes in, the dial system selects the appropriate card, then reads it by means of light beams and phototransistors. Should the preferred route be in use the system looks up an alternate route.

It is a simple matter to keep thousands of cards up to date when new switching points are added or routing patterns are changed to improve service. New cards are quickly and easily punched with the latest information to replace out-of-date cards.

This efficient, flexible way of keeping your dial system up to the minute was devised by switching engineers of Bell Telephone Laboratories, who are continually searching for ways to improve service and to lower costs. Right now most of the Long Distance dialing is done by operators, but research is hastening the day when you will be able to dial directly to other telephones all over the nation.

BELL TELEPHONE LABORATORIES

Improving telephone service for America provides careers for creative men in scientific and technical fields.

READERS FORUM

Control for High-Wattage Water Heaters

To the Editor:

During the past year you have written several editorials, and your readers have presented discussions on the provocative subject of domestic water heater operation. As a result, there seems to be a general agreement on some points, but on at least one point there is still disagreement.

The concensus seems to be that by using high wattage heating elements the size of the tank can be reduced and the heating rate increased, thus making the electric heater competitive with the gas heater in regard to cost and operating results. Furthermore, the power company's load curve will not be materially altered by changing from low wattage to high wattage elements if the heaters are uncontrolled.

However, these discussions have not prevented a divided opinion regarding the advisability of providing automatic control for domestic water heaters. Those who advocate the elimination of control have some points in their favor, but so far no one has shown how it is possible for a power company to sell power profitably to a domestic consumer or about 1¢ per kwhr if due consideration be given to the fixed charges on the investment necessary to provide the additional peak load.

One of the arguments against a control system wherein the heater is disconnected during the early evening hours has been that a new load peak would be established at the end of the circuit interruption period because of the fact that practically all of the heaters would be turned on at this time. If high-wattage heating elements should be used, this difficulty would be greatly increased. Therefore, if high-wattage heating elements are to be used and the heaters are to be disconnected during the early evening hours, it would appear necessary to adopt some method of preventing a high peak load when the heaters are reconnected.

This can be accomplished by either one of two methods. The high-frequency control system as now used in some localities can reduce the load to any desired amount or this can be done by using the simpler 3-function time switch system. This involves the use of a time switch which can close the circuit, open the circuit, or reduce the load of a large group of heaters to a predetermined value about 9 PM and then allow their load to increase to full value at midnight or a little later.

J. K. Ostrander
Consulting Electrical Engineer
United Engineers & Constructors, Inc
1401 Arch Street
Philadelphia 5, Pa.

EW Does Research on Forecasters

To the Editor:

It is always interesting to read about the winner of the Kwhr Pool conducted by Mr Robert M. Hatfield, vice president of Combustion Engineering, Inc (EW Jan. 24, p 117). I am sure that Mr Ray P. Moore, winner of the 1955 Pool, must feel very gratified that his estimate came so close to the final output figure.

However, with 373 entries it seems to me that one or more estimates are bound to be close to most any output figure that actually materializes. What would be of interest is whether the winner, or those close to the actual figure, are making accurate predictions year after year. If there are such individuals, then maybe we better get in touch with them to predict outputs of our individual companies.

Or, is there any group of individuals whose average figure is consistently close? It would also be interesting to know whether the average or median of all entries is consistently close to the actual output.

If it has not already been done, a little research on this topic might be of considerable interest.

V. E. Hill
Assistant System Planning Engineer
Duquesne Light Co
435 Sixth Ave
Pittsburgh 19, Pa.

● Mr. Hill has stimulated EW to do a little research. Here are the results:

1. Of the 373 entries in the 1954 contest, 121 were within 1% (below or above) of the correct figure.

2. No winner has ever repeated. No one person or group of persons has been close year after year. This can partly be explained by the heavy turnover among contestants. Of 294 contestants in 1952, only 243 were entered in the last contest.

3. The contestants are free and uninhibited, something they wouldn't be if they were estimating output for their own companies. They can guess as wildly as they like—their only punishment: loss of publicity and some kidding from other contestants.

4. No man can scientifically predict output for the entire country. There are too many factors involved.

5. The pool average is practically always within 1%. The average of those in the 1955 contest was 476,155,000,000 kwhr and was so reported on page 80 of the May 31, 1954 issue.

A Reader Spots an Error

To the Editor:

I think you made a mistake as to the amount of concrete (250,000 cu ft) required to build the dam at Roanoke Rapids. I am referring to the caption under the center picture on page 15 of the Nov. 22 issue.

R. R. Lautenschlager
Consulting Service
Box 143A
West Cheshire, Conn.

● We certainly did. The correct figure is 250,000 cu yd.

New loss-of-field relay provides automatic protection of machine and system

When a synchronous machine loses its field, both the machine and system stability are seriously threatened. Low excitation can lead directly to thermal damage of the machine. In addition, the machine may go out of synchronism and draw sufficient reactive power from the system to upset system stability.

The new Westinghouse HLF relay protects both the machine and system. When low field conditions cause the machine to exceed its capability, an alarm is immediately sounded. Warned in time, the operator can take corrective measures without taking the machine off the line.

Should the system voltage drop to a point threatening system stability, a self-contained voltage element in the relay will immediately trip the machine.

All relay components are coordinated to prevent false tripping in event of low-voltage conditions alone, or external faults. The relay is adaptable to all types of synchronous machines without modification.

For the best in relays, rely on Westinghouse leadership in relay engineering. Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-40463

YOU CAN BE SURE...IF IT'S

Westinghouse

WASHINGTON COMMENT

REA Asks More Practical Loan Legislation

Repeal of state allotment formula would permit loans to co-ops which need them most. At present some states have unused funds that others could use

Congress is getting ready to repeal the state allotment formula which limits the distribution of Rural Electrification Administration loans among states. This action would loosen restrictions on federal electrification loans but holds promise of a more reasonable distribution of loans. The formula was written into the REA Act to guarantee a more equitable allocation of loan funds among the various states.

Cooperative leaders have long pressed for modification of this statutory requirement which also directs that at least 50% of REA's loan money go into states with the lowest ratio of unelectrified farms. REA Administrator Ancher Nelsen last fall announced he would ask Congress to repeal the provision. Three bills are now in the legislative hopper, and one of these should pass with little trouble.

Nearly All Farms Electrified . . . Most apparent justification for abolition of the formula is that it has already served its purpose. Nearly all occupied farms are being served, and there have been no gross inequities charged in the allocation of loans among the states.

Now the problem, as REA sees it, is to help borrowers meet their power demands on the basis of requirements. This means heavying up lines, providing more transmission and distribution facilities. It involves granting additional loans based on individual cases, rather than attempting to distribute loans evenly among the states.

Repeal of the state allotment formula will give Nelsen more flexibility to make loans where they are needed. There is no intention of letting down the bars on the strict requirements for making individual loans. A co-op or other borrower will still have to show need and offer evidence that the federal loan can be repaid.

Because applications from some states have occasionally exceeded the amount of loan money available for these areas, Nelsen has been forced to withhold loans while millions in funds earmarked for other states have been unused.

Nelsen is usually viewed as a conservative man whose judgment has seldom been questioned. What he is asking for are fewer restrictions on the loan authority voted by Congress so that he can more effectively put his policies to work.

In the past Nelsen has had to rely on rather unusual means to by-pass the formula. A while back, he dug into his multi-million dollar contingency loan fund to make available less than $10 million for a single co-op loan. Under the peculiar accounting system used, this brought the entire contingency loan fund into the same column with carryover funds. Nelsen didn't do this as an arbitrary gesture to thwart the formula. He simply saw a deserving need which could not otherwise be met.

Congress, too, has occasionally relied on detours. It has voted large contingency loan authority and sometimes over-appropriated in order to make sure there would be carryover authority not subject to the formula restrictions. Abolition of the formula would, of course, obviate the need for such devices.

Formula Could Block Co-op-Company Agreements . . . Where the formula has pinched REA hardest in the past has been on applications for huge loans to build transmission and generation facilities. One or two large loans of this type in a single state would pretty much preempt the loan funds available for that state. At present several joint co-op-electric company ventures which could be voided by the state allotment formula are in the works.

A case in point is the Colorado area where at least three prospective co-op-electric company plans for integration are in the works at varying stages and where the state allotment formula might prevent their consummation.

TECHNICAL NOTES

Inadequate interrupting capacity of devices operated at 600 v and below was responsible for 85 accidental injuries in one state in one year.

Spinning aerial cable secondaries and attaching service drops before hoisting to position on poles does a better job for less money.

Grounding conductors, for maximum effectiveness, must share conduit with their respective line conductors.

Voltage-switched capacitors, suitably time delayed, can regulate the voltage of "un-regulated" substations.

Power saws, automatic wire splicers, and radio are rated, next to service-devoted personnel, the greatest aids to service restoration after hurricanes.

Defensive driving contributes to self protection against traffic accidents caused by careless drivers.

Failing capacitors improperly fused can disgorge innards like trench mortar fire. Flying contents trace costly patterns on parked autos.

Wound rotor motors with step up gear make efficient and economical drives for boiler feed pumps.

MILLIONS OF FEET NOW IN SERVICE

BECAUSE OF PROVED PERFORMANCE

ROCKBESTOS

PNR SMALL DIAMETER CONTROL CABLE

There are still a few who haven't yet taken advantage of PNR . . . the lighter, smaller control cable. But it's come a long way since we first introduced its Polyethylene, Nylon, Rockhide insulation to industry just six short years ago.

Today, many utilities specify it. And there are millions of feet in service.

If you haven't tried it yet, get the complete PNR story today. Write or ask your nearest Rockbestos representative.

*Average determined by comparison with conventional control cable.

PROPERTIES OF PNR

46% smaller in area* . . . 28% smaller in diameter* than conventional control cable.
Use smaller conduit and fittings or put more conductors in existing conduit.
Lighter, easier to handle, store, ship, pull through conduit.
Dielectric breakdown . . . over 40 times operating voltage.
Rated 600 volts . . . conductor operating temperature 167°F.
Flexible from 167° to —67°F.
No cracking!

ROCKBESTOS PRODUCTS CORPORATION
NEW HAVEN 4, CONN.

NEW YORK • CLEVELAND • DETROIT
CHICAGO • PITTSBURGH • ST. LOUIS
LOS ANGELES • NEW ORLEANS
OAKLAND, CALIFORNIA • SEATTLE

Economic Depreciation Denied

Illinois Commerce Commission makes such a ruling in turning down $24-million rate increase asked by Illinois Bell

The Illinois Commerce Commission has rejected a plea of Illinois Bell Telephone Co for economic depreciation. This was contained in an order dated Jan. 13, 1955, which turned down, in its entirety, the request for a $24 million a year rate increase for the company.

As to the contention of the company that the rate of return should be adjusted upwards to compensate for economic depreciation, the order said "Dr (J. K.) Langum's testimony was concerned largely with the subject of inflation and its impact on the current cost of plant consumed. His major thesis was that a computation of depreciation expense on the basis of original cost of plant, as the company is required to do under the Uniform System of Accounts, leads to an understatement of real depreciation expense. Instead of suggesting a change in the method of computing depreciation expense, however, Dr Langum advocated an adjustment in the rate of return of approximately one percentage point. We are of the opinion that no such allowance should be made in rate of return. We have explained our reasoning somewhat more fully in discussing depreciation expense, elsewhere in this order."

Company Favors RCN

In rejecting a staff witness' contention that the retirement loss basis of accounting depreciation is the proper one for rate making purposes since it was contrary to that prescribed by the Uniform System of Accounts, the commission said, "A parallel line of reasoning leads us to the conclusion that the upward adjustment contended for by company witness Langum for so-called 'economic depreciation' should not be made. Witness Langum contends that the straight line, original cost computation of depreciation understates the current cost of plant consumed for Illinois intrastate by $7,488,000 for the year 1953.

"Although the company, in its evidence on this point, urges us to take this 'deficiency' into account in fixing rate of return, and not in computing depreciation expense, the real basis of the argument constitutes a contention that the computation of depreciation expense on a straight line, original cost theory understates the true 'economic' depreciation. The amount of the understatement is computed by witness Langum by the use of the Consumers Price Index. Thus, in substantial effect, the contention is for a reproduction cost basis of allowing for depreciation in the making of rates."

ICC Backs Original Cost

"But the function of depreciation is not to cover the 'economic' cost of plant consumed. Rather, it is to amortize over the useful life of the property the service value of that property, and service value is the net of original cost, salvage and cost of removal. When the depreciation calculation has been made as near as may be to achieve this result, it has been done correctly, and no further allowance with respect to depreciation is proper in the light of our Uniform System of Accounts.

"An additional support for this conclusion should be pointed out. As the record shows, straight line, original cost depreciation is used almost uniformly by the public utilities of this country and likewise very extensively by unregulated companies. Rate of return is measured primarily by earnings available from investments in alternative enterprises of corresponding risk. In such comparisons it is necessary that the companies be compared on a uniform basis, and the only basis available includes depreciation computed on a straight line, original cost theory. Thus, to base rates for this company on such a comparison and then allow an additional amount in rate of return to cover so-called 'economic depreciation' would result in giving this company a higher earnings level than is appropriate under Illinois law."

Among other things the ICC found the fair value rate base to be 15% over "net book" amount as compared to a previous case wherein fair value was found to be 37% of "net book." The ICC also found that 5.5% to be a fair rate of return; and as company was earning this on the fair value rate base, no increase in rates was justified.

FINANCIAL BRIEFS

Glendale, Calif., City Council has disclosed that a settlement has been reached with the Southern California Edison for purchase by the city of facilities in the annexed area of La Crescenta for $890,000 . . . **Pennsylvania legislature** has received a bill which would require the Pennsylvania Department of Highways to pay at least half of the cost of changing municipally-owned public utilities in road construction projects.

Citizens Utilities Co is making a survey of shareholder sentiment and reaction to dividend policy. Company is seeking to learn what shareholder reaction is to three alternative dividend policies: (1) Payment of dividends entirely in stock form; (2) Citizens' historical policy of a combination of cash and stock dividends, in effect for eight years, and (3) dividends entirely on a cash basis.

Issuance of $1.5 billion in California general obligation bonds to build the Feather River project has been recommended by State Engineer A. D. Edmonston, who also said the current state legislature should appropriate $16 million from general funds to get preliminary work out of the way so actual construction could start in 1956.

Southern California Edison Co will pay April 30 a quarterly common stock dividend of 60¢ a share as compared with 50¢ in previous quarter . . . **Kansas Gas & Electric Co** is giving "consideration to a stock split" and is considering listing its stock on a national exchange . . . **Wisconsin Fuel & Light Co** has received Public Service Commission approval to sell $250,000 first mortgage bonds . . . **Tucson Gas,**

(*Continued on page* 204)

For outdoor plants...

Metermax control features all-weather electric drive units

Forced draft fan vanes are controlled by outdoor-mounted Metermax drive unit shown above.

In winter snow or summer heat, weather never bothers the electric drive units which do the muscle work for Metermax Combustion Control. Ideal for modern outdoor station design, these units are specifically designed to operate without added protection from the elements. If a forced draft fan is mounted outdoors, for example, its damper control drive mechanism goes outdoors too —without any steam jacketing or weather shelter. Because driving power is electrical, there's no danger of stoppages due to freezing or clogging.

Here are other drive unit features of interest to power engineers:

Self-Locking: double worm and gear drive can't be backdriven; no locking devices needed.

Self-Releasing: no unlocking or resetting by operator.

Simple Remote Control: instantaneous transfer from automatic to remote manual control; no reset position because system is electric.

Emergency Operation: geared-down handwheels on each unit make it easy to move heavy dampers, etc.

True Position Indication: electric indicators are unaffected by friction or sticking of dampers.

Dependable Power Source: drive units operate from plant auxiliary power, independent of compressed air supply.

For a copy of our new folder giving full details on Metermax drive units, write to Leeds & Northrup Company, 4938 Stenton Avenue, Philadelphia 44, Pa.

LEEDS NORTHRUP

Electric Light & Power Co has received Arizona Corporation Commission approval to sell $3.5 million first mortgage 3¼% bonds due 1985 to institutions.

Iowa Electric & Power Co has sold $9 million of 3⅛% first mortgage bonds due 1985 at 99.517% to 15 institutions . . . **Missouri Public Service Co** is planning to split its common stock on 3-for-1 basis.

Seattle, Wash., Corporation Counsel A. C. Van Soelen has ruled that Washington state must compensate city for costs of relocating public utility facilities because of highway construction.

REGULATION BRIEFS

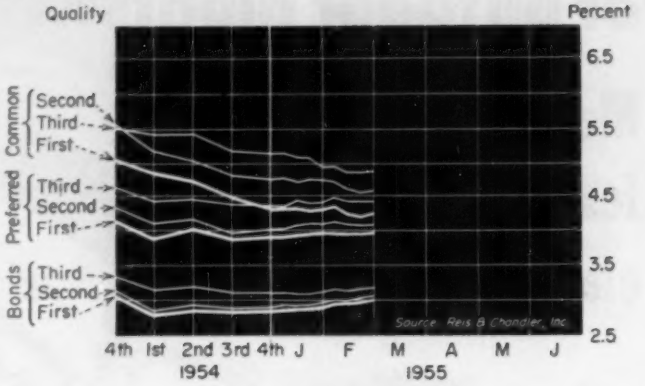
Industrial Relations Committee of the Georgia Senate has voted 5-to-4 to kill a resolution calling for a broad investigation of public utilities and their rates . . . **Pennsylvania legislature** has received a bill which would require hearings in all rate cases of utilities by the Public Utilities Commission. Under the present law, the PUC hold hearings at its discretion.

Ohio Edison Co and the City of Akron agree on a 10% increase in street lighting rates . . . **Pennsylvania Power & Light Co's** Vice President A. D. Root told the PUC that Scranton area electric rates will not change as a result of a merger of Scranton Electric Co with PP&L.

D. S. & O. Electric Co-operative, Solomon, Kan., has received Kansas Corporation Commission approval to reduce rates $4,800 a year . . . **Jacksonville, Ill.,** municipal system has asked the City Council for about 5% rate boost.

Colorado's legislature has received two bills that would require utilities to pay all or part of the expense of their regulation by the state Public Utilities Commission. The first proposal would require that utilities pay into the state's general fund each year the full amount determined by the legislature as necessary to operate the PUC. The other bill would require utilities to pay 75% of the cost of the commission's operation.

Today's Utility Yields—%



	BONDS			PREFERRED STOCKS			COMMON STOCKS		
QUALITY.....	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
Feb. 24.....	3.00	3.03	3.14	3.95	4.07	4.40	4.42	4.56	4.82
Feb. 17.....	2.99	3.03	3.14	3.96	4.09	4.41	4.20	4.54	4.82

Utility Earnings

COMPANY	PERIOD MONTHS	ENDED	NET INCOME 1955	NET INCOME 1954	EARNINGS PER COMMON SHARE 1955	EARNINGS PER COMMON SHARE 1954
Carolina Power & Light.....	12	Jan.	$7,968,263	$7,320,704	$....	$....
Central Vermont Public Service	12	Jan.	1,408,494	956,511	1.31(a)	0.89(a)
Detroit Edison.....	12	Jan.	22,685,694	20,671,852	2.11(a)	1.96(a)
Iowa Southern Utilities.....	12	Jan.	1,279,109	1,320,806	1.55(b)	1.61(b)
New York State Electric & Gas.	12	Jan.	9,448,874	9,170,043	2.59	2.55
Public Service Co of New Hampshire and subsidiaries.....	12	Jan.	3,839,806	2,735,911	1.31(a)	0.90(a)
Southern Co, consolidated.....	12	Jan.	23,076,066	22,613,493	1.27	1.25
Virginia Electric & Power.....	12	Jan.	17,049,440	13,081,527	2.24(c)	1.80(c)

Notes—(a) Based on average shares outstanding; (b) Based on 746,311 shares in 1955 and 736,881 shares in 1954, and (c) Based on 6,600,000 shares in 1955 and 5,999,980 shares in 1954.

Utility Financing

COMPANY AND DESCRIPTION	AMOUNT OF OFFERING (000)	OFFERING PRICE	YIELD TO PUBLIC
WEEK OF FEBRUARY 24—MARCH 2			
BONDS			
Rochester Gas & Electric—1st mtg 3⅛% due 1985....	$10,000	102.772%	3.23%
Pacific Gas Electric—1st mtg due 1987.....	50,000	(see Electrical	World, p 73)
PREFERRED STOCK			
Carolina Power & Light—50,000 sh cum $4.20 no par...	$4,975	$99.50	4.22%
COMMON STOCK			
Carolina Power & Light—505,000 sh.....	$12,373	$24.50	4.49%
South Carolina Electric & Gas—210,053 sh (being offered commonholders on a 1-for-15 basis, record Feb. 24 to expire March 10 with oversubscription privileges. Owners of less than 15 shares can subscribe to one full share).....	3,676	17.50	5.14
Central & Southwest — 600,000 sh.....	20,100	33.50	3.90
SCHEDULE FOR MARCH			BID DATE
BONDS			
Atlantic City Electric—1st mtg due 1985.....	$10,000	.....	Mar. 9
Kansas Gas & Electric—1st mtg due 1985.....	10,000	.....	Mar. 15
Arkansas Power & Light—1st mtg due 1985.....	15,000	.....	Mar. 30
PREFERRED STOCK			
Kansas Gas & Electric—60,000 sh $100 par.....	$6,000	.....	Mar. 15

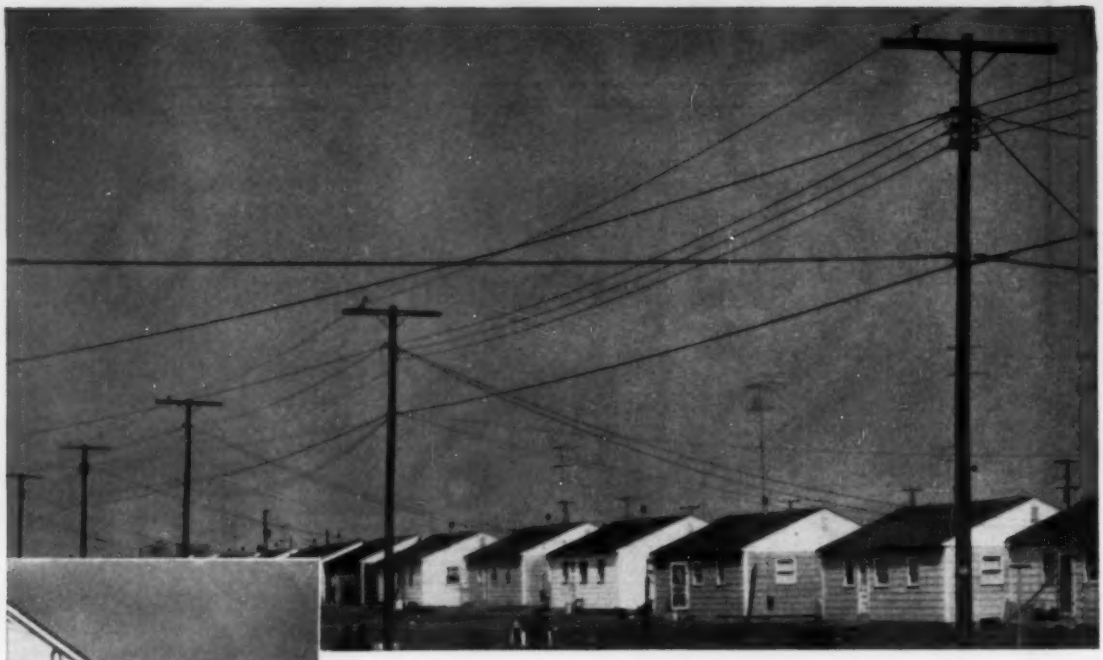
STATISTICS

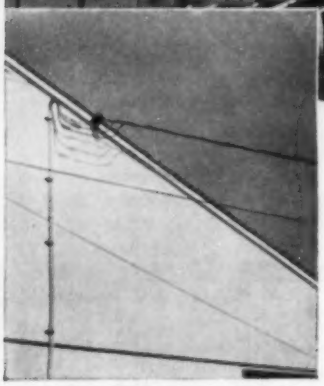
Power Statistics . . .

			Latest Month	Preceding Month	Year Ago	Annual Change %
Capacity	million kw	Dec.	102.52	101.12	91.49	12.1
Peak—Class I Systems	million kw	Dec.	85.5	81.9	78.6	8.8
Estimated Dec. '55 Peak	million kw	Nov.	96.1	96.2	98.3	−2.2
Production—billion kwhr		Dec.	43.43	40.22	39.08	11.1
hydro			9.05	8.12	8.67	4.3
fuel			34.38	32.10	30.41	13.1
Sales—billion kwhr		Nov.	33.87	33.75	31.59	7.2
residential			10.07	9.70	9.02	11.5
Commercial			6.14	6.40	5.50	8.8
industrial			15.38	15.24	14.95	4.5
other			2.29	2.41	2.12	7.5
Fuel Consumption		Dec.				
coal—million tons			11.90	10.70	10.88	9.4
oil—million barrels			7.67	5.82	7.62	0.6
gas—billion cu ft			74.93	88.66	70.94	5.6
Net Income Class A & B Co's—$ million		Nov.	94.91	86.98	83.86	13.2
Residential Customers—millions		Nov.	43.04	42.95	41.89	2.8
revenue per kwhr			2.70¢	2.70¢	2.74¢	−1.5
avg. kwhr per customer			2,528	2,512	2,332	8.4
avg. annual bill			$68.26	$67.82	$63.90	6.8

Business Statistics . . .

Indexes: 1947−49 = 100					
FRB Industrial Production	Jan.	130	128	124	4.8
ENR Construction Cost	Feb.	135.1	135.1	128.9	4.8
BLS Cost-of-living	Dec.	114.3	114.6	114.9	−0.5
NEMA Sales	Dec.				
insulation materials		138	124	133	3.8
electric appliances		84	90	69	21.7
household refrigerators		62	47	53	17.0
Wholesale prices	Jan.				
motors and generators		121.6	121.8	124.3	−2.2
transformers and regulators		128.1	128.1	128.1	....
switchgear and fuses		135.3	135.3	135.1	0.1
GNP—annual rate—$ billion	4th Qtr.	362.0	355.5	360.5	0.4





Wire assembly is anchored to house and pole by the bare neutral. Older method required anchoring three wires, cost more in time and material.

One man can easily carry 500 feet of this drop wire covered with BAKELITE Polyethylene.

33% LESS WEIGHT FOR DROP WIRE

BAKELITE Polyethylene covering on Aluminum Wire means easy handling, fast installation

Weight is no problem with the 90-foot spans of service drop wire illustrated, as used by The Ohio Power Co. One man easily carries a 500-foot coil of this wire. Its two 7-strand No. 4 aluminum conductors are covered with a minimum two sixty-fourths inch of BAKELITE Polyethylene, the lightest commercial plastic. Result—33% less weight than wire with a covering formerly used.

The bare neutral supports the whole assembly. It's the only wire anchored, so installation is simpler and more economical than with older types. Conductors are free of tension.

Several additional advantages may be expected for wire and cable applications where BAKELITE Polyethylene is employed as covering. Tests on the black compound indicate a service life of several decades. It won't festoon. It resists moisture, oil, most strong acids, alkalies, and mildew, stays tough and flexible at −70 deg. C. and resists deformation at temperatures around 90 deg. C. It can be used in thinner wall sections, making pulling and stripping easier.

Ask your cable supplier for complete details on wire and cable covered with BAKELITE Polyethylene, or write Dept. CA-63 for a list of representative suppliers.

BAKELITE BRAND POLYETHYLENE FOR WIRE COVERING

BAKELITE COMPANY, *A Division of Union Carbide and Carbon Corporation* UCC 30 East 42nd Street, New York 17, N. Y.
In Canada: Bakelite Company, Division of Union Carbide Canada Limited, Belleville, Ontario
The term BAKELITE and the Trefoil Symbol are registered trade-marks of UCC

FACTS ABOUT Exide®
MANCHEX® BATTERIES

POSITIVE OPERATION
OF CIRCUIT BREAKERS IS ASSURED BY EXIDE-MANCHEX BATTERIES

HIGH-POWER TESTS AT THE SWITCHGEAR LABORATORY HELP GENERAL ELECTRIC ENGINEERS IN DESIGNING ALL SIZES OF CIRCUIT BREAKERS AND OTHER SWITCHING EQUIPMENT. THE BATTERY USED FOR TRIPPING AND CLOSING BREAKERS IN THIS DEVELOPMENT WORK ARE EXIDE-MANCHEX. THEY PROVIDE THE MOST DEPENDABLE AND DURABLE SOURCE OF POWER FOR UNFAILING OPERATION OF VITAL ELECTRICAL EQUIPMENT.

SINCE 1889, EXIDE ENGINEERS

HAVE EXPERIMENTED WITH THOUSANDS OF BATTERY IDEAS. THE RESULT IS THE HIGH QUALITY EXIDE-MANCHEX BATTERY NOW SO WIDELY USED BY ELECTRIC UTILITIES THROUGHOUT THE U.S.

BUTTONS OF LEAD PROVIDE DEPENDABLE POWER... LONGEST BATTERY LIFE

THE IMPROVED PLANTE TYPE POSITIVE PLATES OF THE EXIDE-MANCHEX BATTERY ARE OF MANCHESTER DESIGN-AN EXCLUSIVE EXIDE FEATURE. BUTTONS OF LEAD DELIVER THE POWER YOU NEED, WHEN YOU NEED IT. OVER A HALF CENTURY OF DEPENDABLE PERFORMANCE IN ELECTRIC UTILITY STATIONS HAS DEMONSTRATED THAT EXIDE BATTERIES WITH THEIR BUTTONS OF POWER ARE YOUR BEST BATTERY BUY-AT ANY PRICE!

LET EXIDE HELP SOLVE YOUR SWITCHGEAR BATTERY PROBLEMS. ❶ CALL AN EXIDE SALES ENGINEER FOR FULL DETAILS. ❷ WRITE FOR BULLETIN 210-WHICH TELLS HOW BATTERIES ARE MOST EFFICIENTLY USED IN SWITCHGEAR OPERATIONS.

Exide INDUSTRIAL DIVISION, The Electric Storage Battery Company, Philadelphia 2, Pa.

What to Do When LOADS GROW

Use a Vault-Type Power Unit to Replace 3 or 4 Separate Distribution Transformers On Pole or Platform

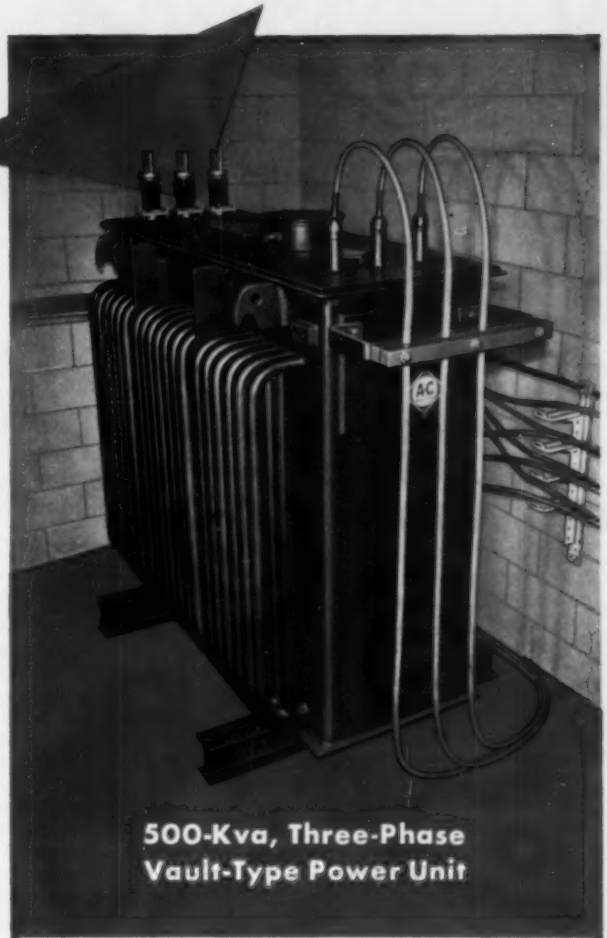
New vault-type power unit saves space, is exceptionally easy to install, reduces maintenance.

It combines three or four distribution core and coil assemblies in a single tank. Unit is so compact that it requires less than half the space needed for a conventional bank of three or four distribution transformers. Put it anywhere: the tank is completely welded and the unit can be operated continuously in locations which may become flooded. Find a spot inside — as was done in the installation shown at right — you can locate it in any corner.

Factory Assembly Simplifies Installation

Units consist of either three or four distribution transformer core and coil assemblies to supply three-phase power or three-phase power and single-phase lighting loads. Metering connections are simplified by mounting current transformers in the case. Potential transformers can also be mounted internally if desired. Assemblies are internally connected at the factory and leads are terminated at the cover. There is no primary or secondary bus work to be done at the point of installation. If a three-assembly unit is desired for present needs, room can be left for a fourth assembly to be added at a later date when requirements increase.

A-4499



500-Kva, Three-Phase Vault-Type Power Unit

The Allis-Chalmers vault-type power unit is the ideal answer to space or load growth problems for schools, hospitals, hotels, large apartment houses, shopping centers — anywhere loads grow fast. Get complete information from your nearby A-C office or write Allis-Chalmers, Milwaukee 1, Wis., for all the facts.

ALLIS-CHALMERS

A-C ALLIS-CHALMERS